June 1982

MICROCOMPUTING

T.M.

A WAYNE GREEN PUBLICATION

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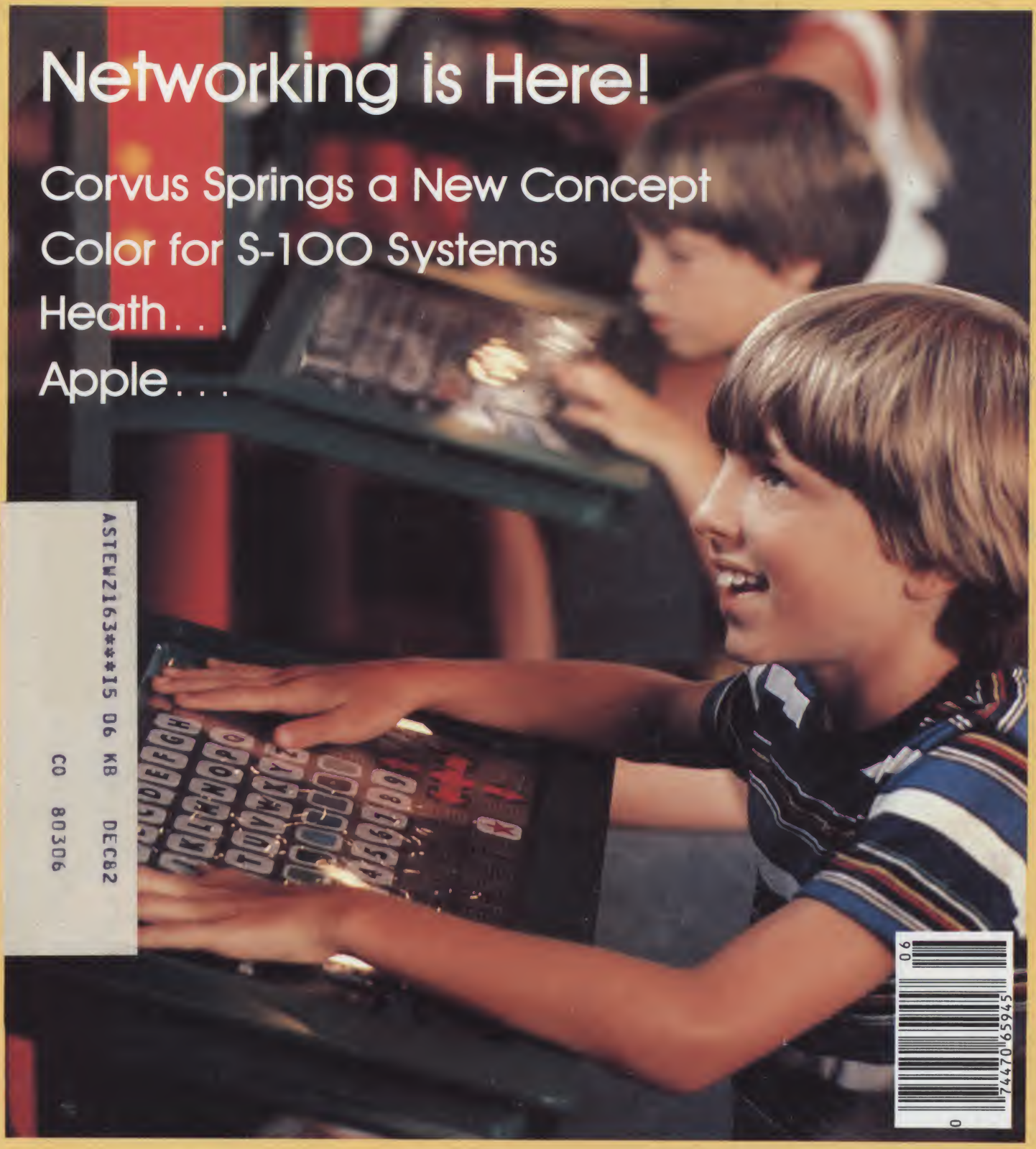

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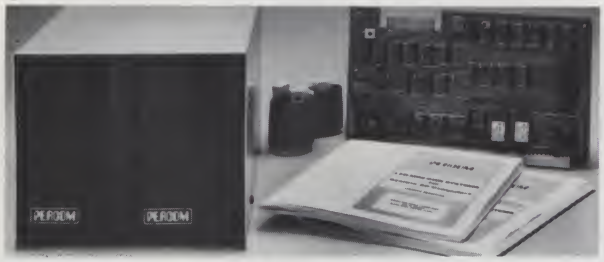

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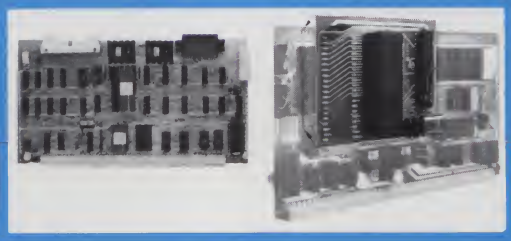

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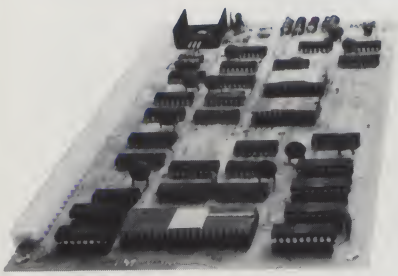

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MICROCOMPUTING

On the cover: A frequently repeated scene at Sesame Place in Bucks County, PA, where the nation's largest collection of educational computer games affords youngsters from age 3 and up the opportunity to play and learn with microcomputers. This educational setting, with nearly 70 Apple microcomputers in use, represents a unique application of networking.

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↙See List of Advertisers on page 146

By Wayne Green

All Aboard The Orient Express

Asian Tour Schedules Stop In Peking

Have You Been to China Yet?

The Asian electronics show tour this fall will, for the first time, include a visit to Peking, and then around the world to Munich and London.

This yearly tour, which has been attracting about 200 computer and electronics people, is scheduled to coincide with major electronics shows in Tokyo, Seoul, Taipei and Hong Kong. Tour members stay at the top hotels and are allowed, on the average, one day of travel and two days at each show. Thus in two weeks you can get to four major shows, seeing the latest in consumer electronics, computers and parts. You'll also get some major Chinese and Japanese meals.

The businessmen in these countries are extremely anxious to meet American businessmen. They want to sell their products here and are looking for good American products to import. You should make contacts if you need parts or even sub-assemblies made for your own products. With most American firms importing at least part of their assemblies from Asia, you should look into the prospects if you are going to remain competitive. Hundreds upon hundreds of Asian businesses have little other way to do business with you than via these shows.

The cost of the two-week tour is around $2500, and the three-week tour, which includes Peking and Munich (and still another electronics show), runs around $3500. You will never forget a single minute of your visit to China. Sherry and I visited there in late 1980 and are looking forward to Peking this fall. The tour starts in late October.

If you don't fancy China, you can take your own route back, visiting the Philippines, Singapore, Australia, etc. Or you can zip back and miss all the fun. Don't let business interfere too much with seeing the world.

This is your chance to see all of those Japanese computers you've been reading about and to talk with the firms. You'll also have a chance to visit Akihabara, the electronics center of Tokyo, and see the many computer stores there, or buy your next watch at a real discount.

Time is already growing short so send for the complete details. Write to Sherry, Commerce Tours, Wayne Green Inc., Peterborough, NH 03458. You'll need plenty of time to have Commerce Tours get your visas and make all of the travel arrangements.

The Game Room

With Commodore predicting a sale of one million computers this year—most of them in the $150 to $300 range—there is obviously going to be a big need for information and evaluation of these low-end systems. Add to the Commodore projections the Atari, Texas Instruments, Bally and other game computers in the under-$400 range, and you have quite a group.

I'd like to get a game section going in this magazine to cover this low-cost computer field. Readers will be interested in all of these low-end computers, so let's see some articles on them. We'd like to know how they work, what their limitations are, what their possibilities are for expansion, what software is available, how easy it is to write software for the system, and so on.

Software and the use of the computer have to be approached from both the kid and the adult level. Some programs may be just fine for younger age groups, but not for teenagers. Perhaps we can get some objective evaluations of software from readers who can get input from kids of different ages.

Hackers have undoubtedly opened up all of the systems and have some words of wisdom for us on ways to improve them, add peripherals, make them talk to other computers and so on.

Readers may be interested in surveys of the software available for the different systems. Has a market opened up yet for software provided by supporting firms or are most of the programs still coming from the manufacturer? How difficult is it to supply software? We know that since these systems are being sold through mass distributors it will be difficult for small firms to get a foothold, even if the systems are accessible.

If you decide to write about the low-end computers, you should remember that we pay for articles and thus you are embarking on a small business sideline with all of the tax advantages this entails. It may be that much or all of the computer system you use can be written off as business expenses. Check with your local tax expert for the details on that. It's nice to have fun and make money too.

Since I'm anxious to get this started quickly you can be sure that your material will be handled fast and could get into print fairly soon.

Articles are relatively simple to prepare. They must be typed, double-spaced with generous margins, be written as simply as you can manage, include any illustrations and photos—preferably black and white 8 × 10 glossies—that are sharp, contrasty and well balanced. Send articles to me, care of The Game Room, *Microcomputing*, Peterborough, NH 03458.

Other Articles Needed

We're also looking for articles on support accessories and peripherals for the more common computer systems. It has not entirely escaped the microcomputer industry that our sister publication, *80 Micro*, has built up a $300 million industry around the TRS-80. Smaller firms don't have the marketing team, the advertising money, the writers, the PR men, and all the hundreds of people it takes to sell millions of dollars' worth of equipment and software. Thus they are dependent upon getting started with much smaller investments. This means selling by mail and through a limited number of outlets, and it means that it is terribly important to have a magazine which caters to their needs.

You can help these firms. Keep your

COMMODORE VS. APPLE

IBM, TANDY, ATARI AND ALL THE OTHERS

"The new Commodore 64 personal computer has 33% more user memory than Apple II+® and 300% more than IBM.® And, at an incredible $595, it's well under half the cost."

—William Shatner

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Built-in User Memory*	64K	48K	16K	4K	16K
Programmable	YES	YES	YES	YES	YES
Real Typewriter Keyboard	YES (66 keys)	YES (52 keys)	YES (83 keys)	YES (65 keys)	YES (61 keys)
Graphics Characters	YES	NO	YES	NO	YES
Upper and Lower Case Letters	YES	Not Included	YES	YES	YES
Maximum 5¼" Disk Capacity Per Drive	500K	143K	160K	178K	96K
Audio Features					
Sound Generator	YES	YES	YES	NO	YES
Music Synthesizer	YES	NO	NO	NO	NO
Hi-Fi Output	YES	NO	NO	NO	NO
Video Features					
TV Output	YES	YES	YES	NO	YES
Input/Output Features					
"Smart" Peripherals	YES	NO	NO	NO	YES
Software Features					
CP/M Option (Over 1,000 Packages)	YES	YES	YES	YES	NO
Game Machine Features					
Cartridge Game Slot	YES	NO	NO	NO	YES
Game Controllers	YES	YES	YES	NO	YES

*Each "K" equals 1,000 characters or digits of information. Disk drives and printers are not included in prices. Models shown vary in their degree of expandability.

The new Commodore 64 may well be the most outstanding personal computer ever introduced.

It represents a breakthrough in microcomputer technology, with an amazing 64K of memory, and features not found in systems costing many times more. (See chart)

- How can Commodore do it? Commodore is the *only* U.S. personal computer company that manufactures its own microprocessors, the "heart" of all personal computers. (Commodore microprocessors are used in Apple and Atari computers, and many others.)
- Commodore is the *only* personal computer company with a full line of computers—from our $299.95 VIC-20 to the remarkable new $1995 Super PET that speaks 7 high-level computer languages.
- And with over a quarter of a million computers sold worldwide, Commodore is proven for performance and reliability.

PERIPHERALS

The Commodore 64 also has a full range of low-cost peripherals, including disk drives, printers and communication devices. Our low-priced telephone modem permits you to access data banks and interface with other computers.

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See List of Advertisers on page 146

Poor Man's Floppy

HIGH SPEED CASSETTE SYSTEM

FOR TRS-80*

Now the widely acclaimed JPC Cassette System is available for your TRS-80* computer. The price is only $90.00

TC-8 Cassette System
JPC Products
Albuquerque, NM
Kit: $90
Assembled: $120

[Reprint of June 1980 Review, *80 Microcomputing*]

by Carl A. Kollar

I guess I don't have to tell any TRS-80 owners how frustrating the cassette system that comes with the computer can be. Even with the factory mod that's available, the annoyance of loading and checking programs becomes just barely tolerable.

If you're like me, after you've just plunked down a chunk of money for a Level II 16K machine, "you ain't got nuttin left" for even one disk drive at 500 bucks apiece. So you suffer.

A reasonable alternative is the Exatron Stringy Floppy (ESF). This will cost you about 250 bucks and totally eliminates your loading and saving problems, automatically and fast. I've had one of these for about six months and love it!

But, if the price is still too steep, have I got a device for you!

The Device

The February 1980 issue of *Microcomputing* had an ad that intrigued the hell out of me. It was a high-speed cassette system by JPC Products acclaimed as a "poor man's floppy." It made all sorts of seemingly ridiculous claims such as "loads five times faster," "stores 50,000 bytes on a 10-minute cassette," "less than one bad load in a million bytes with the volume control anywhere between one and eight."

All this for a measly [90] bucks? How could this be? A call to Albuquerque answered a few questions: Yes, it had its own power supply, and, it stored programs five times faster because it utilized higher density data. The computer outputs the information at a higher rate out of the rear keyboard connector.

The ad had even claimed anyone could build it even if you have never soldered before. JPC would make it work, if you couldn't—for free. I was sold. I placed my order, and it arrived about two months later (parts shortage).

I work in electronics, so I found the unit exceptionally easy to build. It took about an hour. The manual is superb. (That's better than great.) It was clear, concise and exact with no ambiguities. Important parts placements are stressed (polarity markings on electrolytics, bands on diodes, etc.).

JPC was right! With these instructions, you couldn't go wrong. The board quality is excellent. It is double-sided and parts locations are clearly marked on the component side of the board. There are no jumper wires to install. JPC utilizes PC traces and plated-through holes for connections to traces on the other side of the board.

Also, there are absolutely no adjustments or settings to bother with.

The documentation is a sheaf of 8½ × 11 papers stapled together. It is written in the nicest format I've seen in a while. Each command and/or subjects is covered on its own sheet in large type. All explanations are in easy to read English—not computerese.

Commands and Features

SAVE"filename": Saves your BASIC program on cassette.
LOAD: Reads the next BASIC program from the cassette.
LOAD"filename": Searches for and loads the specified file from cassette.
LOAD? and LOAD?"filename": Reads file from cassette, and compares contents to memory.
LOADN: Prints a list of all the programs on a cassette, until interrupted by the "break" key.
LOADN"filename": Same as above except the tape will stop at the end of the program named.
KILL: Removes the file manager program from memory so that the extra memory can be used by large programs.
RSET: Allows the operator to rewind and position the tape on tape recorders that have these functions tied to the motor control jack.
RUN"filename": TC-8 searches for a specified program and runs it immediately.
PUT"filename": Same as SAVE "filename", except it is for use with system tapes.
GET: Same as LOAD, except it is for use with system tapes.
GET"filename": Same as LOAD "filename", except it is for use with system tapes.
GET? and GET?"filename": Same as LOAD? and LOAD?"filename", except it is for use with system tapes.
GETN and GETN"filename": Same as LOADN and LOADN"filename", except it is for use with system tapes.
OPEN: Required before cassette input or output of a data file can be attempted.
CLOSE: Required to end a cassette data file.
PRINT#: Allows numerical or string data to be output to a cassette file.
INPUT#: Allows numerical or string data to be input from a cassette file.

I haven't counted them, so I don't know about the "one load in a million bytes" claim, but my son, Anthony (age 11), loaded about 30 of his programs from his Radio Shack format tape to a new TC-8 format tape. He's run them all and found no bad loads.

Unlike the standard tape system, you can position your tape anywhere before the program you want and not have to look for a blank spot between programs. The TC-8 patiently waits for the program you want and then starts loading without getting confused by the portion of the previous program you just fed it.

Try that on your regular cassette system; you'll wear out the reset button. ■

ORDER NOW

To order your TC-8 kit, send your check or money order for $90.00 plus $3.50 postage and handling to JPC PRODUCTS CO., 12021 Paisano Ct., Albuquerque, NM 87112 (New Mexico residents add 4% sales tax). Credit card orders accepted by phone or mail. Personal checks will delay shipment. We will otherwise immediately ship you the TC-8 kit, the cabinet, the ribbon cable, the power adapter, an instruction manual, and a cassette containing the software.

For Mod I Level II only.

eyes open for new and interesting gadgets and software for the Apple, the Commodore, the IBM, and other major microcomputers. If you are the kind of person who buys things first, you can pass along the benefits of your experience to other prospective customers via an article in this magazine.

With so much junk out there—both in programs and gadgets that almost work but are not dependable—many people are afraid to shell out their money on something new until they've gotten some comforting reports from those who have tried out the product and found it good. It's not only the quarter-million-dollar-computer buyers who are getting the shaft these days.

If the product is over six months old, please don't bother about it. Readers want to know all about *new* products. For example, a printer review should detail what system it will work with and what problems were encountered in getting it to work right. Did it work right off or did you have to make a special cord for it? Any software problems? I mention that because I've used quite a few printers in my office and I can't remember one that didn't challenge us in one way or another, requiring calls to the manufacturer and a lot of head scratching.

Perhaps you've tried some of the single-page feeders for printers, and may have even found one that works well. Please pass along this information! We all want to get your guidance.

I try to get out to as many shows as I can, even if it is for only a day at each. I meet many people who have taken the time to evaluate products and software, but who somehow have the idea that the information they've discovered is not of interest. With hundreds of different accounting packages out there, how is a businessman to make a decision? If you've tried a few and compared them, think seriously about writing an article and giving the rest of us the benefit of your experiences. Tell us what you looked for and what you found—and what was missing.

Our reader survey shows that the readers of this magazine are spending about $10 million per month on computers and computer products. You can help smaller firms to benefit from this by writing up your experiences and having them published here.

Perhaps you are a programming enthusiast now and have worked up some patches for popular programs to fix bugs, open them up for further uses or made them more flexible. Let's get those patches into print so our readers can benefit from them.

You may have worked up some multi-user software. Don't keep it a secret. More and more small offices and schools want to know how to hook their micros together for communications or mutual database access. Readers want practical information on what to buy and how to get the most from it.

Not one of the instruction manuals that come with computer systems is perfect. Perhaps you can help the owners of the more popular systems by providing them with documentation that really should have come from the manufacturer. *80 Micro* has run circles around Radio Shack when it comes to documentation.

Remember that *Microcomputing*'s readership includes the relative beginning owner of a microcomputer, so try to keep your explanations as simple as you can. Oh, you don't have to go to the lengths we require for *Desktop*, where no technical language is permitted. That magazine tells businessmen what computers can do and helps them buy what they need without having to become dedicated hobbyists or experts.

This magazine assumes that everyone either understands the common buzzwords, or will shortly. We do not assume, as do some other magazines, that everyone is a computer scientist. The more you can include simple explanations of your work in your articles, the more valuable they will be.

Mini-Micros

As if we didn't gain enough in compactness with the development of large-scale integration chips, two developments will tend to further reduce the size of computers.

When the first microcomputers were put on the market I looked over the design and noticed that it took a whole board full of chips just to generate the monitor screen picture. Southwest Tech came out with a keyboard screen generator combo in 1975, year one of microcomputers. It seemed to me that this function begged to be put onto a single chip.

I discussed this with all of the heads of what was then the microcomputer industry and was assured that this would never happen. Now I see more and more of the functions of our computers being packed together into ICs, with results such as the Sinclair made possible.

I hope it will come as no real news flash that we are going to see even more of the same. As the quantities of production increase, it becomes more practical to pack the chips together, reducing boards full of chips to a single mammoth circuit.

But this is by no means the end of miniaturization. I'm sure that many of you have wondered if someone might come up with something smaller than the dual inline package (DIP) we use. They not only waste space, but have little spindly legs that bend all too easily. Well, they've come out with new packages called LCCs, leaderless chip carriers, that are substantially smaller than DIPs and include leads that can't get bent.

Harris Semiconductor's (Melbourne, FL) prototype memory module incorporates double side LCC attachment for a 5:1 space savings ratio over DIPs.

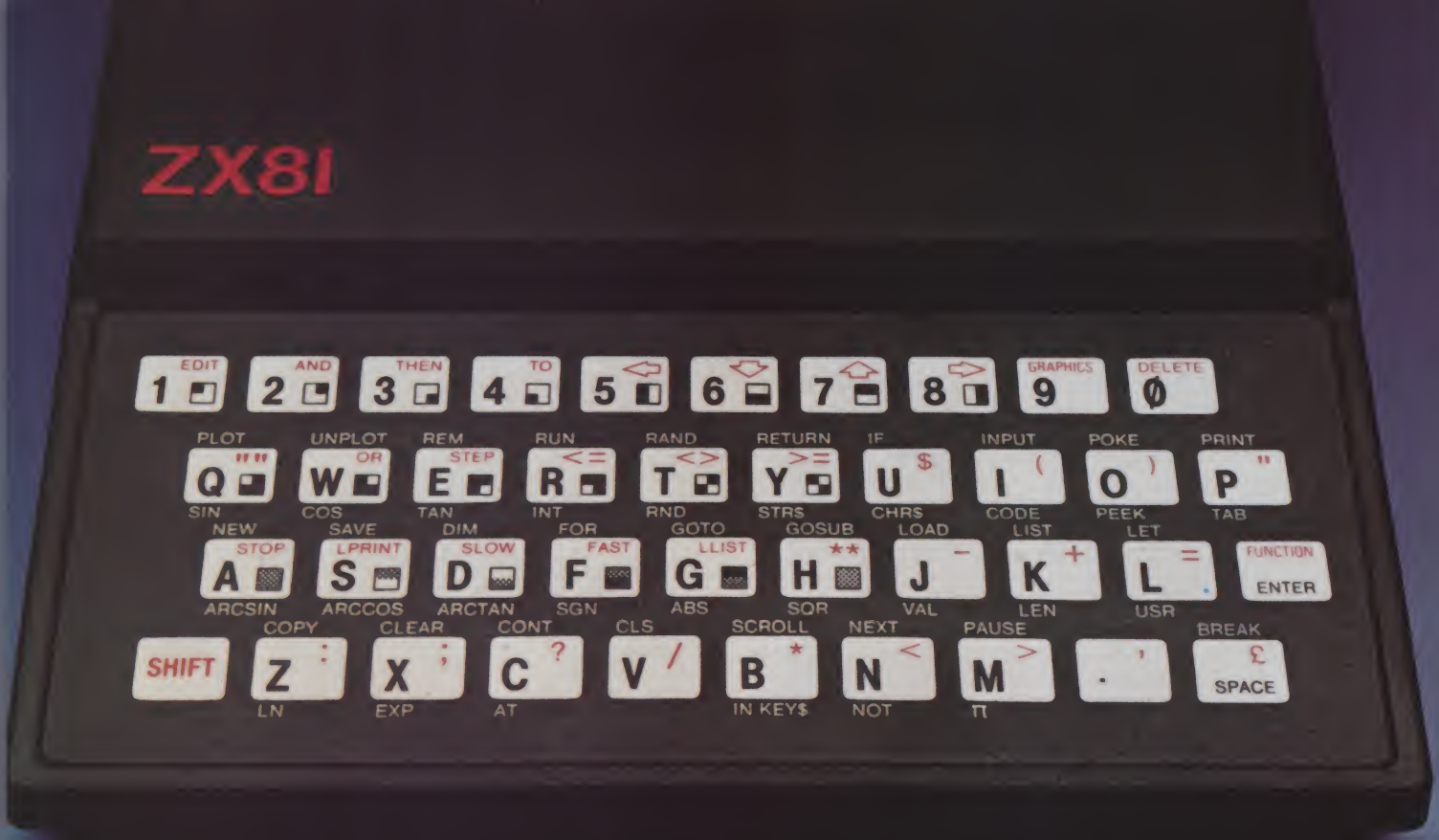
The new LCC packages have several important advantages over DIPs in addition to their smaller space requirements. Being flat and with no leads to bend, they needn't be shipped in long, cumbersome tubes. And they can be machine-inserted easily. Handling does not hurt them. Thus they will be cheaper for manufacturers to use, easier to change for testing and easier to keep on hand for replacement.

The LCCs are about one fifth the area of a DIP and come in pin counts of up to 64 pins. They are also appropriately thinner than DIPs by about one fifth. This means that LCC-stuffed boards can be stacked much closer together, or that boards will fit better into cramped spaces, such as under keyboards. The shorter leads will increase the speeds of circuits as well as simplify rfi shielding problems.

The awkwardness of DIPs has made their testing before installation in a computer an expensive and time-consuming process. With LCCs there will be little problem in building automated testing equipment for them, thus cutting down substantially on the cost of building computer systems. Most of the computers made today are tested after the DIPs are inserted. A computerized test unit tells the operator which DIP is bad. Better the bummers be sorted out before the computer test.

Automated burn-in of LCCs can be done simply, further reducing the cost of testing computers. In this way every LCC would be run, perhaps at high temperatures, for a given period before being used. This will cut down on the need for computer burn-in after completion—a further saving for manufacturers.

This looks like a needed development. One wonders why it took so long to be invented.□



THE $149.95 PERSONAL COMPUTER.

Introducing the Sinclair ZX81.

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These numbers are for orders only. If you just want information, please write: Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061.

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By Robert Baker

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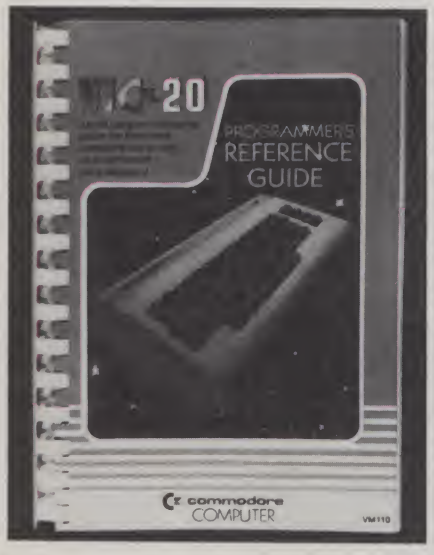


The VIC-20 reference guide for would-be and experienced programmers.

Well it seems this month was meant to be a time to catch up on my reading. I finally got my hands on a copy of the new VIC-20 *Programmer's Reference Guide*. Several days later I received a copy of Compute's *First Book of PET/CBM*. These were shortly followed by a copy of *PET/CBM Basic* from Prentice-Hall. So here's a quick review of all three.

Programming the VIC-20

The VIC-20 *Programmer's Reference Guide* is divided into four sections: Basic Programming, Programming Tips, Machine Language and Input/Output. A short applications guide is really a bit of subtle advertising for various VIC accessories and programs, but it does give a nice list of ideas on ways to use the system. The book has a number of useful charts and tables in the appendices. For hardware enthusiasts, there's even a full schematic of the VIC-20 inside the back cover.

The first part of the book describes the various commands and operations of VIC Basic in detail. It's a handy, yet thorough, reference for VIC Basic but does not attempt to teach you how to program.

Each entry in the Basic vocabulary guide explains how the instruction is used and includes simple examples. You'll even find information on how to abbreviate most of the commands to save typing time or to cram more commands into each program line. The sections on numbers, variables and operators should be especially helpful to newcomers to the world of computers.

The second portion of the book covers various programming tips to write your own Basic programs. About one third of this section covers cursor controls and program editing, using the GET statement, and simple discussions of various ways to save memory within your programs.

The remaining two thirds of the section covers graphics and sound, with a good deal of information packed into those 20-odd pages. There's a nice description of the programmable characters and how you can use them for high-resolution or multi-color graphics. Several sample programs are included at the end to help illustrate the techniques covered, including the mixing of sound and graphics.

The third part of the book is an introduction to machine-language programming and the internal workings of the machine. It attempts to provide information for all levels of users but is primarily for more advanced programmers.

It starts out with an overall functional description of the VIC-20 to give you an idea of the way the VIC-20 processes programs within the system. The overview contains a block diagram of the system as well as the internal 6502 microprocessor itself. Simple memory maps, along with a discussion on how a Basic program is stored in memory, are included. All of this information should be useful to some degree for just about any VIC user.

The discussions on machine-language programming may be confusing to novice programmers. The book starts out nice and easy, giving you a good idea about what is going on, with references to similar operations in a program written in Basic.

However, most of the material covers the operation of the 6502 microprocessor, its addressing modes, branches and subroutines. There is no explanation of the individual instructions, just copies of the various instruction charts and tables from the MCS6500 Family Programming Manual. Don't expect to learn how to program in machine language from this section; you'll still need additional reading material.

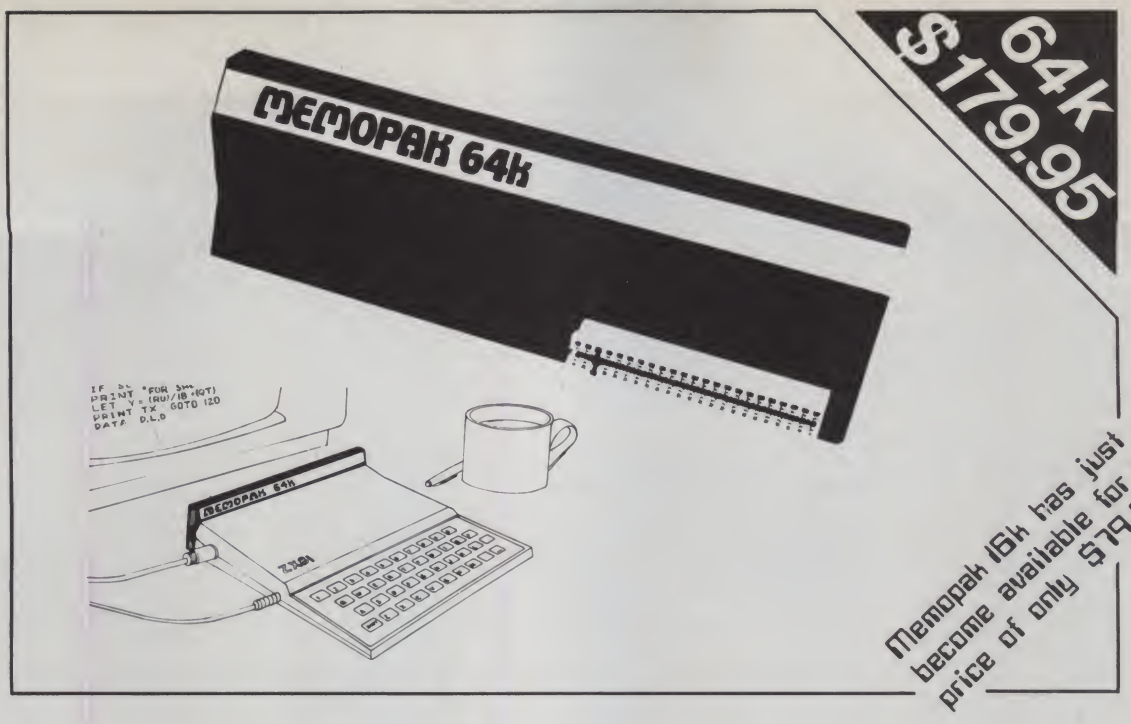
If you've had any real programming experience, this material is all very handy and nice to have in one place. There are even detailed memory maps for the VIC's operating system. For the really advanced, the book includes a description of the VIC Kernal. This is a standardized jump table to various input, output and memory management routines in the VIC operating system. A complete, detailed description of each routine is provided along with the calling address, register and stack conventions, required preparatory routines, and examples.

The remainder of the section describes the 6560 video interface chip and the 6522 versatile interface adapter. The book describes each function of the chip and how it relates to the VIC-20 system.

The last part of the book covers input and output to the VIC system, and includes a complete description of the user port, the serial bus and the VIC expansion port.

There's a big write-up on the RS-232

Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.



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interface, but a few very important details are omitted. In particular, a previous section of the book refers you to this section for the valid secondary addresses when opening the RS-232 channel, but the information is just not there. It would have been really nice if the book had included some information on connecting RS-232 devices to the VIC for those unfamiliar with the RS-232 handshake lines.

Brief information is also included in this last section on using a joystick, paddles or a light pen with the VIC. There's even a short section on the VIC graphic printer and how it's used.

Appendices at the end of the book feature many useful charts, maps and tables. However, novice programmers might need more help than what's presented in Appendix I when converting programs to VIC-20 Basic from other systems. The authors only touch the surface with the information they present, but it should be useful. Don't forget, there's also a full VIC-20 schematic and a complete index as well.

As a whole, the book is very well done and probably the best I've seen from Commodore. It provides information of value for users at all levels of experience. As its name suggests, the book is a reference guide for programmers. It will not teach you how to program, but it will provide a wealth of information in one handy source that is just not available elsewhere.

PET/CBM Collection

The *First Book of PET/CBM* contains 45 of the best PET/CBM articles from the 1980 issues of *Compute* magazine. The 250+ pages are divided into six chapters along with several appendices. The material is reprinted exactly as it appeared in the magazine except in a slightly larger type.

Unfortunately, *Compute's* program listing conventions were not defined anywhere in the book. You can generally guess at the correct cursor or reverse on/off controls, but it may be a little confusing.

The first chapter, "Getting Started," contains a nice history of the early days of the PET written by Bob Crowell. Other articles cover basic information on ROM versions, Basic tokens, compacting data and using joysticks. Chapter two, "Programmer's Corner," includes many different programming hints for Basic.

The third chapter, "Beyond the Basics," gets into machine-language programming and various aspects of using the 2040/4040 disk. Graphics, including plotting techniques with the 2022 printer that should also work with the newer 4022 printer, are covered in chapter four. An interesting collection of utilities, including my Compactor program, is presented in chapter five.

If you're into communications, chapter six contains two short articles that may be of interest. The appendices contain a few memory maps compiled by Jim Butterfield, and there's even a small index at the end of the book.

All in all, this book is a super collection of early PET/CBM material. If you've missed any of the early issues of *Compute* then this book is a definite must. On the other hand, long-time subscribers may debate spending $12.95 for reprints of articles they've already seen. I still think it's a nice book, even without my three articles that were included.

PET/CBM Basic

PET/CBM Basic was designed to be used as a text for learning to program in Basic using the PET computer. It's suitable for introductory programming courses at the high school, junior college and university levels. It can also be used for self study with your own PET computer.

The strategy of the book is to "learn by doing." You're led step by step through all aspects of Basic programming on a PET with many examples, illustrations and exercises. The emphasis throughout the book is on learning how to actually use the commands in putting together a program. When a new command is presented you get to see how and why it's used, not just what it is and what it does.

All examples are illustrated with many photographs of a PET screen. This was really a nice idea, but it's almost impossible to make out some of the graphics characters that appear in the examples. It's especially difficult to understand the cursor controls that appear in various programs when the graphics characters are barely readable.

This 150-page softbound book sells for $12.95 and is published by Prentice-Hall. It's written by Richard Haskell, an engineering professor at Oakland University in Michigan. He's also the author of two similar books for the Apple and TRS-80 Color computers.

The book is well-written but is geared primarily for the older 8K PET and the 2001 series 40-column systems. Appendix B actually shows keyboard layouts from the original small keyboard 8K PET. The CBM 8032 is mentioned in another appendix, but Basic 4.0 and the use of the disk are not discussed at all. However, it's still a good learning text if you're new to programming.

League Bowl—24

Being an avid bowler, I was happy to receive a review copy of the League Bowl-24 program package from Briley Software (PO Box 2913, Livermore, CA 94550). This software package can maintain all necessary records for a bowling league of up to 24 teams. It will run on any 32K PET/CBM with a printer and either a disk or tape.

All league parameters are entered only once, while names and stats can be easily edited at any time. The program scores, calculates and updates all league data after you simply enter the individual game scores for each player. It's easy to verify the data since it's re-displayed on the same format as on the score sheets collected from the bowlers.

After everything is entered correctly, you can save the data on tape or disk from week to week. Complete league standings are printed after all calculations have been completed.

There are a host of options and features just too numerous to list here. It will handle the majority of leagues that use standard bowling formats—handicap or scratch. However, it cannot handle Peterson point scoring or leagues that do not bowl three-game series.

Since the programs are entirely in Basic, you could modify the programs if really necessary. In fact, modifications and improvements are solicited by Briley Software for possible inclusion in future versions. An optional program is available to print a complete summary for each player and every team at the end of the season. Other programs are available for scoring tournaments, etc.

The standard package is very well written and runs smoothly. User prompts and menus are used throughout, making it easy to use for almost anyone. It's well documented and reasonably priced at $145.

If you're a league secretary with access to any PET/CBM system then you shouldn't be without it, considering the amount of work it can save. Besides, just think about the impressive reports you could be handing out each week.

Commodore News

Commodore has announced a new magazine called *Power/Play* that will be aimed specifically at the rapidly growing number of new Commodore home-computer users. The magazine will be devoted to showing people how to use the "power" and "play" capabilities of their computer for personal development and entertainment right in their own homes.

Power/Play will provide information on new products, applications, games, programming tips, learning at home, telecommunications and users clubs. Freelance articles, programs, photographs and cartoons will also be regular features of the new magazine.

The premier issue of *Power/Play* was scheduled for this spring and will be published quarterly for the remainder of 1982. *Commodore Magazine* will now be devoted to non-home use of

Commodore's entire line of microcomputers and will continue to be published bimonthly. Subscriptions to *Power/Play* will be available through *Commodore Magazine* as well as through use of subscription forms included with all new systems. Individual copies will also be available at Commodore dealers.

***

Two new tax preparation systems are now available on disk for users of Commodore systems. Developed by CFI of New York City, and available from Commodore dealers, the Professional Tax Preparation System and the Personal Tax Calculation System run on the PET 4032 or CBM 8032 systems with either the 8050 or 4040 disk drives.

The Professional Tax Preparation System is designed for the professional tax accountant or consultant. It has the capability to do regular or "income averaging" tax returns, as well as simultaneous separate or joint returns. It prepares information for and then prints directly on Internal Revenue Service 1040 long or short forms, and schedules A, B, C, D, E, F, G, ES, SE, 2106, 2441, 2210, 3903, 3468, 5695 and 1040-ES. It also computes state 1040 forms for California, New Jersey, New York and Pennsylvania, as well as the Florida real property tax. The Professional Tax Preparation System costs $800 with annual updates currently priced at $500.

The Personal Tax Calculation System is a scaled-down version of the larger package and calculates both 1040 forms and schedules A, B and G. It's priced at $69.95.

***

Since the introduction of Commodore's three-for-two Educational Grant program in September 1979, over 13,000 systems have been delivered free to public and private schools of all levels. If you include the units actually purchased, this means Commodore has helped provide nearly 40,000 systems for education.

The program grants a free system of equal value to any educational institution that buys two systems from an authorized dealer. Only the PET 2000 and 4000 series and CBM 8000 series units are offered under this program; the new VIC line is currently not included.

Misc News

Code Works announced in March that they will end the current series of Cursor tapes with their next issue, *Cursor #30*. They plan to continue selling and supporting all back issues (over 174 programs) and were adding further changes to include the "Fat-40" (40 columns expanded type across a 12-inch screen) model.

With the announcement of the new Commodore systems, the Code Works is planning to start work on products for the new Commodore-64. If their new venture is anything like their previous Cursor tapes, you can look forward to seeing some really first-class programs for the new machine.

Their book titled *PET Fun and Games* is being published by Osborne/McGraw-Hill. The 31 programs in the book are also available as a set of tapes directly from the Code Works, but you'll still need the book for documentation. For more information, you can write the Code Works at Box 550, Goleta, CA 93115.

Brian Riley, a local VIC owner, was kind enough recently to try out a modem interface for me using some of the equipment he had available. The interface was the MDM-1 modem driver for the VIC-20 built by RVR Systems (PO Box 265, Dewitt, NY 13214).

It plugs directly into the VIC-20 user port and does not require any external power. It provides two RS-232 serial ports for connecting a modem and a serial printer, and comes with printed listings for two simple terminal programs.

Brian found that the unit may or may not work with all equipment configurations, since it does not seem to support all the handshaking lines. It would probably be best to check with RVR Systems to see if they think it will work in your particular application. The cost of the MDM-1 unit is slightly high at $59 (plus $3 shipping.)

***

With everyone asking for copies of various programs I've written, I finally decided to put them all together into one package. The programs will only be available on disk, but both 4040 and 8050 formats are available.

All current documentation is provided on a second disk along with a simple utility program so you can print your own copies. The documentation files are actually formatted Word Pro 3 files saved on disk, as I discussed in one of my columns.

So, you'll need a Commodore system with an 8050 or 4040 disk and some kind of a printer to be able to use the package. Please do not ask for copies on tape; there's just too much included. The package contains about 40 program files and almost completely fills a 4040 disk.

The programs are from my PET-pourri column and various articles in *Microcomputing* and *Compute* magazines and include: Disk Master, Basic Assembler, Compactor, Un-Compactor, Black Friday, Word Hunt, House Inventory, Program Finder, XREF, Disassembler, various Word Pro utilities, and much more.

For more information, see *Midnight Gazette* (issue #6) or contact me at my home address. The package will be available through AB Computers, 252 Bethlehem Park, Colmar, PA 18915. The final pricing has not yet been decided.□

↙See List of Advertisers on page 146

By Frank J. Derfler, Jr.

Phone for Those Too Busy to Talk

RCA's Telephone/ Terminal

Welcome to Dial-up Directory! Every month we get together here and look at the newest hardware, software, and happenings in the world of data communications. This month we will focus on two new data communications terminals that have unique features. We will also examine a nice little smart terminal program for the IBM PC. But first, let's see what is new with the information utilities.

Source and CompuServe: Spreading Out

The two leading information utilities, The Source and CompuServe, are spreading out so they can reach more people in more ways. The Source is taking to the cable television distribution systems. Some of the largest cable companies in the nation, including Cox Cable Communications, Cross Country Cable, Storer Cable Communications and United Cable Television, will offer a new service called Sourcecable.

Cable television users will be able to choose their information from menus by pressing appropriate buttons on a hand-held television controller. The Sourcecable information service can be tailored to meet the needs of the cable system operator and the community being served.

This Sourcecable service will differ from the Source we are used to because Sourcecable will use color graphics. This service will be more in line with the videotext kind of utility which has been floating almost aimlessly in the United States, Canada, Japan and Western European countries for a number of years.

Videotext is the great idea that refuses to take off despite substantial testing and investment. It will be interesting to see how well Sourcecable does in gaining acceptance and spreading to other systems.

Special-purpose information utilities are more accepted than general-purpose ones. Farmers make good use of systems like AgNet to get first-hand information about farm product prices and agricultural subjects.

The Dow Jones Information Service seems to be growing strongly with its specialized financial information. Several months ago, The Source countered with Unistox and Stockvue, two services giving in-depth coverage of over 3100

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.

Photo 1. The Northern Telecom Displayphone combines the features of a telephone and terminal into one very attractive and compact desk-top device.

Photo 2. The Displayphone is quite compact. That charming gentleman trying to figure out how to sneak one out under his coat is yours truly. I visited Northern Telecom at their Washington, DC offices.

COMMUNICATE!

"The Professional" Series from SDS

NEW Apple II terminal software

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- **ASCII Express "The Professional"**™ by Mark Robbins and Bill Blue, for Apple DOS**

Businessmen

Q. Do you have difficulty operating your printer when connected to a time-sharing computer? Are files you're trying to download too large for your system buffer? Does your host computer lose data when you send files to it?

A. "The Professionals" incorporate printer ring buffers which allow slower printers to accept data at their own rates. Very large files are easily received by periodically saving the buffer to disk. Unlike some software which can lose data during disk saves, "The Professionals" not only direct the host to stop, but actually wait for it to respond before performing the save. After a successful save, the host is automatically directed to continue. This process may be repeated indefinitely. Lost data during send is virtually eliminated by the widest variety of send options available in any communications software. "The Professionals" ensure fast, reliable data transfer of any valuable business information.

Authors

Q. Does your line of work involve sending written material to others? Are you a program author who would like to send work in progress to a partner or client and know that it arrived intact? What would the ability to instantly send material or programs to anyone at any time be worth to you?

A. "The Professionals" provide the ideal way to send your articles, manuscripts, reports, programs and technical documents to another computer with phone line access. Now you can work WHEREVER you want, and be assured that your data is sent to its destination quickly and error-free. In fact, compared to the fastest mail services, "The Professionals" offer immediate delivery and will save you the purchase price in just a few uses.

Students

Q. Are you bothered by limited access to your school's existing terminals? Would you like to be able to do your school assignments at home at your own convenience?

A. "The Professionals" allow you to access virtually any dial-up school or college computer system over standard telephone lines. This means no more waiting in line for an available terminal or hassles with malfunctioning school equipment. You can even prepare term papers or reports while off-line and send the completed work to the school computer for final printing. Best of all, you can work from home at the times most convenient for you.

Time Share Users

Q. Are you tired of wasting time and money sending or receiving files with inadequate, poorly designed software? Do you find yourself manually performing the same lengthy log-in procedures over and over again? Would you like to automate these procedures for yourself and others?

A. "The Professionals" allow you to send files which have been prepared in advance. They may then be transferred at any time, as quickly as possible — even to several different systems. No time is wasted reviewing information while on line; data may be captured by your computer or printer (or both) to be evaluated later at your convenience. These features assure minimum on-line time and therefore minimum on-line cost.

"The Professionals" introduce macros that are more sophisticated than anything previously seen in communications software. These "hand-shaking" macros allow you to perform complete multi-stage log-on sequences automatically; all you do is specify the system to be called. This eliminates sign-on errors and greatly simplifies operation of the entire system, not only for you, but for other less skilled operators.

Bulletin Boards

Q. Would you like to be able to take advantage of the information featured on local bulletin boards and information services such as The Source, CompuServe, Dow Jones, and others?

A. "The Professionals" open the world of modem communication networks to you. There are already thousands of these systems and networks in use nationwide. "The Professionals" provide an ideal way of accessing these systems. All 80 column boards, external terminals (even the 40 column screen), and currently available communications devices are fully supported, including the Hayes Micromodem II and Novation Apple CAT. All standard baud rates — 110, 300, 1200 and others — are fully supported; BAUDOT too, if your computer is equipped with the Apple CAT modem.

Clubs

Q. Are there other Apple owners with whom you would like to exchange programs or files, but have been unable to do so because of limitations imposed by the software you now use?

A. Any two Apples equipped with "The Professionals" can transfer ANY type or size file with complete error checking and correction. All of "The Professional" packages are fully conversant with each other and operate almost identically. For the first time ever, you can transfer compatible files to an operating system different from yours — error free!

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stocks from the major markets. This has become a popular service with Source users. But the general-purpose information utilities have grown relatively little.

This is, of course, partially a reflection of the national economy, but the state of the national economy seldom prevents people from buying the things they really want. Simply look at the money being pushed into Atari's PacMan machines as an example. Somehow, the general-purpose information utilities haven't brought it all together in the right way yet, but they keep trying. I wonder what happened to those on-line encyclopedias we were told were in the works. They might have some of the general appeal these systems need.

CompuServe is moving in a slightly different direction looking for revenue. CompuServe has operated its own data transmission facilities for a number of years. They use their own networking computers and transmission services to carry customers' data in and out of their Ohio facilities from around the nation. They have now decided to market that capability and become what is called a value-added carrier.

The two major existing value-added carriers are GTE Telenet and Tymnet. These carriers provide value-added services such as error detection and correction, and translation between the protocols of various computers and terminals. .

Compuserve's goal will be to link the data processing and inquiry systems of major corporations. At the same time, they will try to sell their information utility services and their new InfoPlex electronic mail system to the same corporations. A well-priced carrier service may prove an excellent way to market the information service. Private users should also benefit from the added investment in CompuServe's processing power and capabilities.

Displayphone

Would you like to see an example of an ideal data terminal and executive information station? Here is Displayphone, from Northern Telecom (see Photos 1 and 2). Displayphone is both a smart telephone and a bright terminal.

As a telephone, it features automatic dialing and redialing from a small telephone directory which is displayed on the screen. It also allows for hands-free speaker operation.

But Displayphone can handle two telephone lines. While you're on the telephone, you can also be referencing information from your favorite information utility or database without interrupting your voice call. It has both a built-in modem and RS-232C port.

The terminal has two keyboards. The upper keyboard provides telephone number dialing, Displayphone commands, softkeys that transmit a prestored log-on sequence, and number entry through the terminal. This keyboard is all you need to use most menu-driven databases. But, should you enter a system requiring typed commands, or should you want to send some electronic mail, the Displayphone also contains a complete 128-character keyboard in a pull-out shelf. This lower keyboard is small, and isn't meant for data entry or word processing, but it is just right for information retrieval or electronic mail.

There is an interesting bit of executive psychology at work in this dual keyboard packaging. Many corporate executives have a bias against typing. Typing is not their job and they don't want a keyboard on their desk or at their elbow. Yet they want the information an electronic system can provide. The integration of a slip-away keyboard (that obviously is not for *real* typing) makes Displayphone much more welcome on executive desks.

Other features built into the Displayphone include a clock, calendar and an "important event" file that can remind you of things to do at a certain time or date. The terminal has a two-page memory and can serve as a video scratch pad when it is not on-line. It also includes separate RS-232C and parallel printer ports in addition to the modem connection. The total Displayphone package retails for about $2000 in single quantities.

Displayphone is a nicely integrated package that can go a long way to introducing information services into modern homes and offices. For more information, contact Northern Telecom, Electronic Office Systems, PO Box 1222, Minneapolis, MN 55440. Call 612-932-8000.

RCA VP-3501

In the November 1981 issue of *Microcomputing*, I reviewed the RCA VP-3303 color data terminal. At the time I was very impressed with its capabilities and packaging. Briefly, the VP-3000 family of terminals have flat-top flexible membrane keyboards, are lightweight and rugged, and can provide a color graphics video display through a standard television set. The keyboards have 126 ASCII characters and two specially defined user keys. This means they have full upper and lowercase and all control codes. The terminals in this family are designed for use with videotext information utilities or as straight RS-232C terminal devices.

RCA has come out with a new entry in the VP-3000 line which has improved packaging, built-in features and great potential for expansion. The VP-3501 (Photos 3 and 4) corrects some of the inconveniences of the earlier terminals and adds an internal modem.

The on-line/off-line switch is now on the side of the keyboard where it is easier to use. A number pad has been added to the keyboard. The terminal provides for either a modulated rf signal to drive a television set or a composite video signal for a monitor.

It has both modem (Bell 103) and RS-232C I/O ports. The modem connects directly to the telephone line through a modular plug. The package even includes a telephone plug with two sockets so you can use both the terminal and a regular telephone. An optional acoustic coupler lets you connect to telephones without modular plugs.

The complete terminal weighs a couple of pounds and easily slips into the thinnest briefcase. It's a perfect travelling or

Photo 3. The RCA VP-3501 terminal is ready to plug into a telephone jack and connect to the antenna terminals on a television set. The keyboard is pleasant to use and gives a little beep through the TV set when a key is depressed.

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See List of Advertisers on page 146

Photo 4. All the connectors and operating controls (except the on-line/off-line switch) are located on the back panel of the RCA VP-3501. The mode switches select full/half duplex, parity, and other transmission and display parameters.

portable terminal. It connects to the antenna leads of any television set and can have you on-line just minutes after you walk in the door.

In the November article, I explained how these terminals can serve as color graphics and music devices when used with any host microcomputer (for example, a TRS-80 with a serial port and a simple host program). RCA is expanding that capability even more by adding accessories such as a cassette recorder interface, which lets you use an audio cassette recorder to record the received data to review later or to feed to a printer through the RS-232C port. RCA also plans to release a device that will give the VP-3501 a local memory storage and additional processing capability.

Obviously, the product line RCA is building is going to be modular. You can buy the power you need and walk off with self-sustaining portions of the system when you need them. This different approach should appeal to many small companies and original equipment manufacturers.

The RCA VP-3501 comes with membership in CompuServe and the Dow Jones Information Service and limited free time on both services. The entire package, including all plugs, cables and everything you need to get on-line, retails for $399. This is probably the cheapest possible way to get the capabilities of a terminal with a full keyboard. The color, graphics and sound almost come along for free. For more information, contact Scott M. Kennedy, RCA Microcomputer Products, New Holland Ave., Lancaster, PA 17604.

A Program for the PC

I always like to support entrepreneurs. Small business is a much needed part of our economy. Here is one small-businessman who is trying to make it by riding on the coattails of the big guys. Gene Plantz has written a pretty good smart terminal package for the IBM PC, taking advantage of PC and Hayes Stack Smartmodem features. His program, PCModem, runs under IBM's advanced Basic.

Gene uses the IBM's ten special function keys to good effect. The following description of the special function keys also shows what the program does.

Key 1—modem on-line/off-line
Key 2—change baud rates (more on this later)
Key 3—auto redial the last phone number
Key 4—dial a number from a prestored list or by direct entry
Key 5—display the menu
Key 6—toggle printer on/off
Key 7—capture incoming data
Key 8—transmit a disk file
Key 9—hang up the telephone line
Key 10—quit the program

Other keys select such functions as full/half duplex, tone or pulse dial and auto-answer on/off. Note that Gene has provided the ability to speed the Smartmodem up to 600 baud. This is a very "iffy" capability—several Bell 103 standard devices (notably the PMMI S-100 bus modem, the newest Microconnections, and SmartModems) have been used successfully at 600 baud, but their use is limited at speeds over 300 baud.

The telephone connection between the devices must be of high quality and have very low noise. Any burst of noise of a microsecond or so could cause garbled characters. This high-speed transmission is interesting to experiment with, but not usually practical.

Overall, Gene's program is easy to use and well written. The commands are available from the on-line mode without going to a master menu, which is particularly handy for the printer on/off toggle. The program functions smoothly and has several different ways of handling errors. The documentation covers about 14 pages and explains the program's functions in a simple manner.

The version of PCModem I reviewed had a significant omission; it did not provide for line-by-line prompted transmission or slowing down the output of the file transmission function. This is needed for transmitting files to systems (like an Apple Bulletin Board System) that have to pack strings when they receive data.

This activity on the receiving end requires that the transmitting end be able to slow its output and/or respond to prompts for transmission. Gene intends to add this feature and others to PCModem very quickly.

A positive feature of PCModem is its price—$45 on disk. If you have an IBM PC and a Hayes SmartModem, you will find that $45 to be a good investment. Contact Gene Plantz at System Software Services, 1765 Raleigh Lane, Hoffman Estates, IL 60195. By the way, I am receiving a lot of reader mail about the IBM PC; if you're putting together any products for the PC, let me know and I'll try to spread the word.

Staying On-Line

Get on-line! If you market products for data communications or have any specific questions, let me know. Transmit electronic mail to TCB967 on The Source, 70003,455 on CompuServe or to the AMRAD CBBS 703-734-1387. If you send paper mail, please include a stamped envelope with a return address.□

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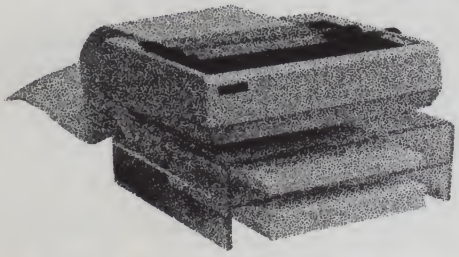

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LETTERS TO THE EDITOR

To Catch a Software Pirate
Answering the Speed Challenge
The Value of Flowcharts
New, Improved VIC Budget

CP/Emulator

In your response to a letter from Chris Larson (Letters to the Editor, March 1982, p. 169) concerning IBM-DOS, you noted that MS-DOS and CP/M-86 are incompatible. You further noted that CP/M-86, in spite of its many announcements for imminent release on the IBM, is not yet available from IBM for their machine.

Lifeboat Associates is marketing a program called CP/Emulator. CP/Emulator allows the running of CP/M-86 application programs under MS-DOS with no degradation in speed.

This product is available now and IBM PC owners may wish to take advantage of the availability of this software.

Michael Olfe
Lifeboat Associates
New York, NY

Software Piracy

Your publisher's remarks in the March 1982 (p. 6) issue describe the drying up of educational software because of pirating within the schools. I suggest two approaches to solving this unfortunate problem.

First, schools ought to be sued when their employees engage in or knowingly permit unauthorized copying. Investigation and development of facts may be easier than you realize. Subpoenas can be used to compel teachers and others to testify under oath. Lawyers' fees may also be much less of a problem than you realize. If software houses can get together against some sizable school districts, so that substantial amounts of money are at stake, then the software houses could probably find attorneys eager to handle the suits on a contingent fee. This means that the lawyers' fees would be a percentage of the recovery, rather than bills for hourly rates. If nothing was recovered, then the lawyers would receive nothing. The client is generally responsible only for expenses, which are more predictable and manageable than fees, as well as much smaller in amount.

Second, sliding scale and low pricing would discourage a lot of pirating. Programs costing $40 create considerable temptation. But if programs are priced at $40 for one copy, or $30 for the purchase of two to five copies, $20 for the purchase of five to ten copies and $10 for the purchase of eleven copies or more, then people will be much more inclined to obey the law and pay for the programs rather than stealing them.

Andrew J. Kleinfeld
Fairbanks, AK

I read your editorial offering a $10,000 reward for software theft convictions with great interest (Publisher's Remarks, Dec. 1981, p. 10). Our hats are off to you. We only wish that such drastic measures were unnecessary.

I would like to propose that your magazine sponsor a national alliance of software creators that would raise funds used to find and prosecute software pirates. Software creators would contribute whatever money they could. The money would be used to fund software registration, a toll-free hotline, a substantial reward program, publicity and a legal defense fund, all used to bring pirates to court.

Contributors to the fund could place a warning sticker on their software stating that the product is registered with the organization, and that theft will be vigorously prosecuted. After the first few "public hangings" I think many people will think twice before stealing the work of others.

Software users stand to benefit too. A few dishonest people make it necessary for many software firms to keep their best creations off the streets. As an example, we have created more than 35 business planning programs that could be used by thousands of small businesses. Until we can find a way to offer these programs to the public at fair prices without giving away years of effort and experience to thieves, the programs will not be made available to the general public. I am certain that ours is not the only firm with this policy. Eventually, the efforts of the organization I have proposed will make it safer to offer software, increasing revenue for programmers and improving the selection of software available to users.

R. C. Mansfield
President
Mansfield and Associates
Beverly Hills, CA

Cromemco's 16K Basic

John Summer's article, "Basic and Pascal Square Off" (April 1982, p. 140), comparing the results of benchmark tests on various types of Basic and Pascal, is excellent. I got curious about the speed of Cromemco's 16K Basic and made a quick comparison by running the same tests. The results given below are very impressive:

Test 1: 2 seconds
Test 2: 6 seconds
Test 3: 15 seconds
Test 4: 19 seconds
Test 5: 20 seconds
Test 6: 31 seconds
Test 7: 42 seconds

What a difference! Much better than all other Basics listed in the article, Apple UCSD Pascal and TRS-80 UCSD Pascal.

M.K. Sambandam
Victoria, TX

Who Says the IBM PC Isn't Fast?

I enjoyed Mike Smith's letter in your April issue (Letters to the Editor, p. 26). Do I detect a challenge for speed?

Several articles have suggested that the IBM Personal Computer is not as fast as it might be if its 16-bit capability were fully utilized.

Using Mike's listing for the Shell sort from page 26 as a starting point, I substituted a reading of the system clock at the start and end of the sort (see Listing 1). From this the elapsed time is computed. Mike told us that the Apple II sorted 500 random numbers in 444 seconds. Fig. 1

```
10 REM *** SHELL SORT ***
20 DIM A(500)
30 CLS:PRINT "Shell sort":PRINT
40 INPUT "How many numbers (2-500)";NN
50 IF NN<2 OR NN>500 THEN END
60 FOR I = 1 TO NN
70 A(I) = RND(1)* NN
80 NEXT I
85 LET B$= TIME$: PRINT "Start  ";B$
90 D=NN: FLAG=0
100 D= INT((D+1)/2)
110 FOR N=1 TO NN-D
120 IF A(N) <= A(N+D) THEN GOTO 150
130 T=A(N):A(N)=A(N+D):A(N+D)=T
140 FLAG=1
150 NEXT N
160 IF FLAG =1 THEN FLAG=0: GOTO 110
170 IF D>1 THEN GOTO 100
180 LET A$=TIME$: PRINT "Finish ";A$
190 START = VAL(RIGHT$(B$,2))+VAL(MID$(B$,4,2))*60+VAL(LEFT$(B$,2))*3600
200 FINISH= VAL(RIGHT$(A$,2))+VAL(MID$(A$,4,2))*60+VAL(LEFT$(A$,2))*3600
210 TIME = FINISH-START
220 PRINT "Time  ";TIME;"secs":PRINT
230 GOTO 40
```

Listing 1. Shell sort program.

```
Shell sort

How many numbers (2-500)? 200
Start  03:05:00
Finish 03:06:04
Time   64 secs

How many numbers (2-500)? 500
Start  03:08:04
Finish 03:12:30
Time   266 secs

How many numbers (2-500)? 300
Start  03:15:06
Finish 03:16:52
Time   106 secs

How many numbers (2-500)? 501
Ok
1LIST   2RUNOAD"   4SAVE"   5CONT
```

Fig. 1. Output from the Shell sort run.

is the output from the Shell sort run on an IBM PC. The sorting time is 266 seconds. Why says the IBM isn't fast?

Martin Oakes
Freeport, IL

What a Crock!

I started reading David Carew's article, "Designer's Delight," in your March issue (p. 54) and got as far as the second paragraph where he says, "Flowcharts are excellent for depicting program logic graphically after the logic is done. They simply aren't very productive in the process of developing that logic." What a crock! I have been in this business over 25 years and I think I know a little about developing logic. The bottom line is that flowcharts are essential with few exceptions and I've found very few programmers who can function without them.

James F. Davis
Menlo Park, CA

VIC Budget Revised

The "VIC Budget" (PET-pourri, Robert W. Baker, March 1982, p. 13) was just what I was looking for. I did make some changes to meet my own needs. Two of these changes might be of interest to other VIC users.

First, the construction of the DATA statements limit to 11 the number of accounts handled by each statement. I have more than 11 accounts in my checking account. This is easily corrected by adding the following two statements:

```
1035 IF C<=11 THEN 1040
1037 IF X=11 THEN N=N+5
```

If the line spacing is removed, a list of 18 accounts, the two totals and the option instructions can be accomodated on the VIC screen without scrolling.

I use my checkbook as a general ledger and at the end of the month post to the various accounts. I like to see the status of each budget item for the month before it is accumulated with the previous months. This is accomplished by dimensioning a new variable Y(A) in line 500, reading the stored money values into this array as shown in line 510 below and deleting line 515.

```
510 FOR X=1 TO A:READ Y(X):M(X)=0:NEXT
```

The program runs as before, only the current month's transactions are shown. To accumulate or update the ledgers an update option is added to the beginning of line 650 and a new line shown below is added.

```
665 IF LEFT$(A$,1)="U"THEN FOR X=1 TO
A:V=Y(A):GOSUB 950:NEXT:GOTO 600
```

I think these features add to the usefulness of the program without violating the original intent of keeping the task simple.

Donald L. Wright
Albuquerque, NM

Information Exchange

Where can I obtain a listing of a Basic that will fit in 8K on an 8080A System?

I built this Mod 80 with 12K RAM plus 1K monitor in ROM. I loaded it with a 2K Tiny Basic which was good for a while. Then I searched for a larger Basic. The only one that I could find was Scelbi's Scelbal.

The Scelbal was eventually loaded and debugged but is proving to be a problem. It doesn't have read-data or proper list routines and has other peculiarities that make it less pleasurable to play with than the Tiny.

Is there anyone out there who sells an 8K 8080A Basic in list form in hex or octal that one can load manually or on cassette? The biggest criterion is that it be low cost.

S.J. Pepler
1195 Shillington Ave.
Ottawa, Ontario K1Z 7Z6
Canada

I have a Z-80 based microcomputer with a Tarbell tape interface and would like to get together with others who have similar systems to exchange ideas and software. Please write if you are interested.

Jim Skinner
1032 5th St.
Bremerton, WA 98312

I am attempting to interface an IBM 1230 optical reader to a TRS Model II. I would appreciate hearing from anyone who has one or intends to do the same.

Louis M. Ferrari
3919 Octave Drive
Jacksonville, FL 32211

Bugs in the Program?

I tried to enter the program from the article "A Rat's Eye View of Mazes" by Brian McCarson (April 1981, p. 84) in my Apple II Plus without success. I haven't seen any letters to the editor about it.

Are there any bugs or changes I should know about?

Fraser R. Lindsay
Montreal, Quebec

Indispensable

I want to let you know that it was Ken Barbier's evaluation of the Olympia typewriter/printer in the April 1982 issue (p. 88) that convinced me to subscribe to your magazine. With reviews like that and the one on database systems in the same issue ("Database Scorecard" by Robert Akers, p. 46), I can't afford to be without *Microcomputing*.

Barry Gordon
Baltimore, MD

Product Support

In the last few months, I have become aware of a trend in the microcomputing industry which is probably brilliant if you are an MBA just out of Harvard; but I'm afraid it won't work in the everyday business of microcomputing.

That is, the manufacturers of both hardware and software are trying to foist off on their dealers the job of product support. I agree that theoretically this would be an ideal situation except that there just aren't enough technical people to go around. In fact, it has been my experience that the technicians working for the manufacturers do not know their company's own products. How can the manufacturers expect a dealer to understand their product plus the products of numerous other firms in the hardware and software lines that the dealers carry?

Robert A. Bogie
New Milford, CT

Well, unless dealers get a lot more training than has been the practice in the past, customers looking for dealer service could be leaning on a weak crutch. There are some manufacturers who have invested a good deal in training dealers, such as Apple, but this is more the exception. Since service of both hardware and software is of utmost importance for a computer, I would suggest some searching questions before plunking down several thousand dollars.—Wayne.

Changes for Heath's Hidden Time-Saver

After trying "Heath's Hidden Time-Saver" by Charles E. Cohn (*Microcomputing*, Jan. 1982, p. 150), I wanted to inform you that Listing 1 will work with Microsoft Basic just as it is written. However, line 90 of Listing 2 needs to be changed to:

```
0090 PRINT M$;D$;",";Y
```

in order to obtain the correct results.

John C. Schultz
Pittsburgh, PA

Keep Up the Good Work!

As a biophysicist whose vocation is data processing, I found the medical articles in the November issue very stimulating. That plus Harold Nelson's essay on style and content encourages me to be sure to maintain my subscription to *Microcomputing*. Keep up the good work: this issue is one example of many excellent issues.

David E. Scott
Columbus, OH

Intercolor Down Under

I am a keen programmer from Down Under with an Intercolor 8001 and would like to correspond with other computerists having a similar machine, with a view to exchanging programs and ideas. I have many disks with games, business and utility programs and am interested in learning assembly language.

Russ Gracie
4 Maybach Way
Dianella 6062
West Australia

80 in the Boonies

I live in a remote area of Michigan and own a TRS-80 Mod II. I would like to correspond with other TRS-80 Mod II owners. My address is PO Box 336, Ludington, MI 49431.

James R. Young
Ludington, MI

Osborne 1 Information

I am the proud owner of an Osborne 1 which I believe to be the finest value on the market today. The documentation for the application programs (Wordstar, Basic and SuperCalc) is excellent, but information on the computer itself is almost nonexistent. I would like to share with your readers some of the information I have found which is handy but undocumented.

Printer toggle (CP/M control-P)—The list device will echo the console if memory location 0DA0DH is non-zero. This will not work in direct memory access programs such as WordStar.

Booting the right disk—On reset the Osborne prompts for a carriage return to boot the disk (left). This makes the left A and the right B, but if you hit a quote (") instead, the right is booted as A, the left B.

Bit rate—The data rate may be set to 300 or 1200 bits per second by the setup program, but no information is given to place it under program control. The following routine allows not only this but also 9600 bps.

```
B03 =  056H          :300 BPS
B12 =  055H          :1200 BPS
B96 =  054H          :9600 BPS
BASE = 0E500H        :BIOS JUMP TABLE
                     :0EA00H ON UNMODIFIED
                     :MODELS
MVI C,BXX            :SELECT RATE
CALL BASE+03CH       :SET RATE
```

Programmable keys—The programmable keys are set with the setup program, as is clear in the manual. They are invoked with a control-0–9 which is not clear in the manual.

WordStar backspace—With the modified cursor control in the upgraded version of the Osborne, the back arrow key, which was the delete-last-character key, is now the cursor left key. Delete is control –(minus), (also undocumented). Other special keys are as follows:

```
{ = ^,
} = ^.
~ = ^/
` = ^ =
```

^ indicates that the control key is pressed with the indicated character.

The capital lock bug (certain characters weren't available in cap lock) has been rectified in the upgrade version and the screen can be made to auto scroll for all programs. However, two bugs remain. In WordStar auto scroll the screen does an annoying left-right dance when the screen is scrolled rapidly vertically. The second bug is that the upgrade BIOS uses registers X and Y. As CP/M is written in 8080 code in which these registers do not exist, there is some justification for assuming that they are inviolate. Any program which uses these will crash on the Osborne unless X and Y are saved on the stack prior to any CP/M call.

Richard Goosman
Hamilton Square, NJ

✓See List of Advertisers on page 146

Corvus Springs A New Concept

Corvus Systems, a pioneer in networking, announces its latest concept—a 16-bit personal computer/workstation—that's called, appropriately enough, Concept.

By Robert Wohnoutka

Corvus Systems introduced the first cost-effective Winchester disk system for microcomputers in 1979. It soon became apparent that a disk system's usefulness could be significantly increased if several users shared the storage capacity of the disk. With many microcomputers costing less than $2000, a network that allowed shared usage of a $3000 to $5000 disk system could further increase the cost-effectiveness of the entire system.

As a result, Corvus developed its first local network—the Constellation Multiplexer—in early 1980. This is a simple network with a Winchester disk system as the central element in a star configuration of up to 64 microcomputers. Each microcomputer can access the central disk system in round-robin fashion.

Corvus local network and shared Winchester disk mass storage in an educational setting.

As the usefulness of local networks became more apparent, further enhancements were made to the disk system and to the network system software. Printer spooling and despooling were developed to allow several microcomputers to share one printer. Software was designed to control access to the central disk storage. This software lets the system manager determine which users will have access to which files.

The Constellation Multiplexer showed that low-cost microcomputers could be linked together to provide an effective, flexible multiuser system. Combining shared mass storage with peripherals such as high-speed printers turned microcomputers into powerful tools.

Omninet

To increase the distance and speed of data transmission within the network while heeding demands for cost-effectiveness, Corvus began development of a new local area network. This network had to be low in cost, easy to install and reconfigure, and able to operate over greater distances. Corvus met these objectives with Omninet, using a twisted-pair cable as the network medium and a common bus for the network configuration.

The twisted-pair cable allows Omninet to use standard RS-422 transceiver chips to provide both high-speed and long-distance capabilities. The common bus topology eliminates the need for a central controller and permits direct computer-to-computer communications. The resulting network system is flexible, low in cost and easy to install over distances of up to 4000 feet.

A modified version of Constellation network management software was immediately adapted to Omninet. The added capabilities of Omninet allowed the Winchester disk system to be located anywhere along the 4000-foot network. And connecting a new computer to the network is just about as easy as adding another speaker to a stereo system.

The Omninet transporter provides an intelligent network interface for each computer in the system. The transporter is actually a powerful microcomputer system that manages network operation and transfers data at the rate of 1 million bits (approximately 60 pages of text) per second.

Omninet uses sophisticated CSMA (carrier-sense multiple-access) technology to control access to the network. Collision avoidance software eliminates the need for complex, expensive collision detection circuitry.

Future

The next step for Omninet is a two-

Address correspondence to Robert Wohnoutka, Corvus Systems, 2029 O'Toole Ave., San Jose, CA 95131.

level approach to local networking. In this soon-to-be-released scheme, the baseband twisted-pair Omninet system handles the computer level and a broadband CATV (cable TV) system interconnects the twisted-pair systems. This affordable approach lets the user buy capability as needed.

For example, consider a growth path that starts with only a few computers. The Omninet twisted-pair system can be expanded to comprise up to 64 computers over a network length of 4000 feet. Then, as the user develops a need for more network devices or longer distances, the broadband CATV system can interconnect unlimited twisted-pair systems up to 40 miles apart.

The broadband CATV system can also be used for voice, video pictures and other wide-bandwidth requirements, but the combination of broadband and baseband (twisted-pair) systems keeps the cost of connecting each microcomputer to less than $500.

The microcomputer user expects high performance at a reasonable cost. Omninet local networks deliver this combination without compromise.■

What Is the Corvus Concept?

Corvus has connected more brands of microcomputers to local networks than any other supplier. The experience gained from working with so many different systems was instrumental in the development of the Corvus Concept—their new personal workstation. Network inspired, the Concept serves as a versatile user interface to Omninet.

It features a full-page dual-orientation screen, a wide range of software including word processing and an electronic spreadsheet and fast 32-bit processing with a large (256K) main memory. Outside the network environment, the Concept will function as a powerful 16-bit personal computer.

To be practical, a personal workstation must be small enough to fit on the corner of a desk and have ready access to necessary peripherals. The Concept, with a 15×17-inch footprint, offers the power of the Motorola MC 68000 processor and up to 512K (256K standard) of random-access memory. Using its built-in Omninet interface, the Concept can share mass storage and expensive peripherals such as modems or printers.

Because each workstation has its own processor, memory, keyboard and display, adding workstations to the system should not degrade system performance. This is not always the case with systems that share a central processor. Workstations can be placed where they are needed within Omninet's 4000-foot range; they are not limited to the typical 50-foot length of an RS-232C serial cable.

The Corvus Concept also supports a new version of network management software called Constellation II. Constellation II offers user passwords, volume access control, spooling and a file locking mechanism.■

The recently released Corvus Concept offers a full-page display that can be oriented horizontally or vertically, the 68000 16-bit microprocessor, expansion slots, some interesting software and complete Omninet compatibility.

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The Operating System Of the Future

Unix is a name appearing more and more often in computer magazines. This article explains what it is, where it came from and how it may be useful to you.

By Phil Hughes

Unix is an operating system that was developed at Bell Labs. It was conceived by Ken Thompson in 1969, and an assembly-language version was developed on a Digital Equipment Corporation PDP-7 computer. From 1971 until recently Unix was primarily used on the DEC PDP-11.

One thing that distinguishes Unix from most, if not all other, sophisticated operating systems is that it was conceived by a computer user. The reason for its development was to offer a *friendly* environment to the computer user rather than the more common reason of selling software and/or hardware. Its development has continued since 1971, so rather than being a 12-year-old product, Unix is a system with 12 years of development and improvement.

In 1973 Unix was rewritten in a language called C, also developed at Bell Labs. Writing Unix in C made it possible for Unix to be transported to other computers. It became necessary only to modify the C compiler to generate code for the new host computer, write machine-dependent routines in assembly language for the new host and recompile Unix using the modified C compiler. This makes all of its support software available on any system to which Unix is transported.

To translate this for the CP/M or Flex user, getting Unix is like getting a text editor, an assembler, many compilers, a spelling checker and many other utilities. And these programs are all well debugged, unlike a "quick and dirty" version of an operating system from Fly-By-Night Software.

What You Get

First of all Unix is a general-purpose time-shared operating system that lets many people simultaneously use the computer system. You could be running a scientific program for design engineering; your secretary could be updating a manual using the text editor; and the line printer could be printing a listing of your program.

Probably the two most important features of Unix are its hierarchical file system and a program called the shell. The file system is designed so files are connected in an inverted tree structure. This makes it possible to have many files (hundreds or thousands) and still offer ease of use.

Fig. 1 represents a small file system organized as the Unix file system is organized. The directory named Root is the main directory and contains the files Mine, His, Mary's and System.

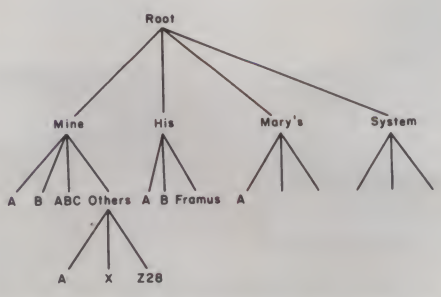

Fig. 1. The Unix file system uses the inverted tree structure, making it possible for large numbers of files to be managed quickly and easily.

Each of these files is actually a directory of files.

Mine contains the files A, B, ABC and Others. Furthermore, Others is also a directory and contains files A,X and Z28. This lets you name a file without worrying about its name conflicting with the name of someone else's file (notice that the directories His and Mary's also have files named A).

Also, you don't have to look through a list of all the files in the system to find the one you want. This also gives the sytem a lot of search time looking for your file. You can also make sub-directories (like Others) to divide your files into lists of manageable size.

The other important feature is the shell, which is a program that acts as an interface between you and the operating system or the program that you want to run. Its capabilities are extensive. A few of its simpler features are

- I/O redirection—The shell can connect your program's input and output streams to files rather than to the terminal.
- Pipes—The capability of routing output of one program directly to input of another program without going through intermediate files.
- Parameter substitution—Expanding wild card file names and much more.

Address correspondence to Phil Hughes, Specialized Systems Consultants, PO Box 806, Mercer Island, WA 98040.

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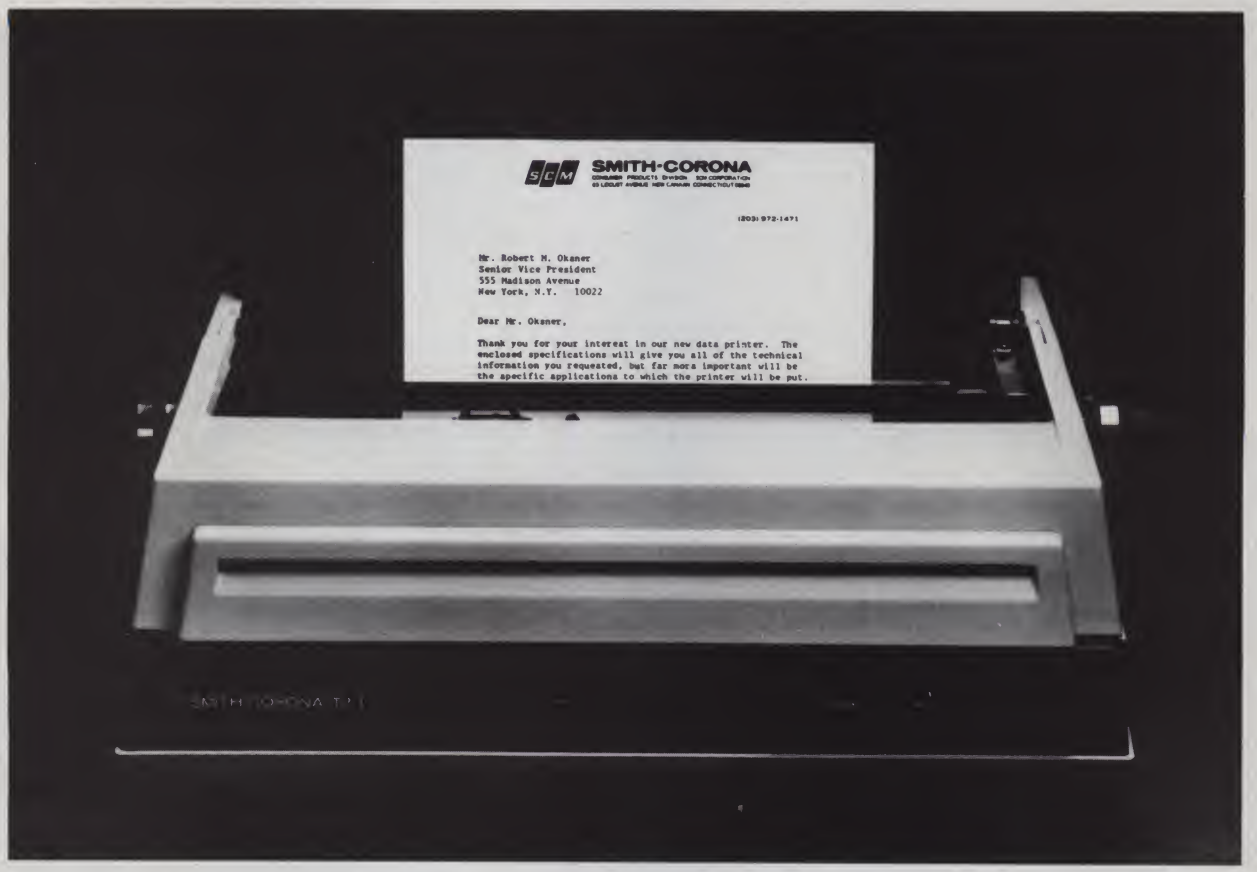

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●Asynchronous processing—The ability to start a task (such as compiling a program) as a background job.
● Control flow—The shell can invoke different programs based on the results of previous program execution.

Let's look at each of these features and see what each means. Most of the programs read input from a file called standard input and send output to a file called standard output. These files are normally sent to your terminal. For example, if I entered the command ls, a list of all the files in my current directory would be sent back to my terminal.

If I wanted to save that list in another file, it would only be necessary to enter the command ls>save. The shell would set up a file named Save as my output file before invoking the ls program.

Now, let's add the concept of pipes. We want to know how many files are in the current directory. The ls program listed those files, one per line. All we need to do is count the number of lines that ls output. The program wc counts words or, with the -l option, counts lines. Using I/O redirection we could do the following

```
ls>temp
wc -l<temp
```

This would cause ls to write the list of files into the temp file, one per line. Then wc would read the temp file and give us a count of the number of lines. This gets the job done but is cumbersome and leaves the temp file around to be dealt with later.

An alternative is to use a pipe that would connect the output of ls to the input of wc. This is written as

```
ls|wc -l.
```

We get the result, do not have to deal with the I/O file and are not left with an extra file. By adding a call to grep, a program that matches patterns, we could determine the number of a certain type of file in our directory. Entering

```
ls | grep . bak | wc -l
```

would tell us how many files in our directory have .bak in their names.

We'll only consider a few basics of parameter substitution in the Unix shell. First, * is a wild card character that will match any string. The ? is another wild card character, which will match only one character rather than a whole string.

Using these wild cards we can make lists of file names to be passed to a program. For example,

```
rm *.bak
```

The general rule with Unix is: If it's generally useful, it has probably been done, and if it hasn't it should be easy.

will pass the names of all files in the current directory ending with .bak to the rm (remove) program. This command will delete all files whose names end with .bak. The command rm a?x will remove all files whose names are three letters long, start with a and end with x.

Asynchronous processing is one of the simpler features of the shell. It is employed by following a command with &. For example, cc *.c& calls the program cc (the C compiler), passing it the names of all files in the current directory whose names end with .c, and then returns control to the terminal. You can then go on using the terminal while the compiler works away in the background.

The last of the shell capabilities I listed was control flow. Let's consider the conditional branch form if ...then ...else ...fi and the test program. The command test -f file returns true if file exists; otherwise it is false. The following set of commands

```
If test -f framus
then echo I found framus
else echo framus not found
fi
```

prints the message "I found framus" if the file framus exists in the current directory. Otherwise, it prints "framus not found."

In the previous examples I have referred to utility programs such as ls, wc, echo, test and rm. There are many more. The following list describes some of the more common ones.

- adb—symbolic debugger used to find where a program ran amok
- ar—maintains groups of files called libraries
- as—the assembler
- awk—scans files searching for specific patterns
- cat—concatenate and print files
- cb—reformats C programs for readability
- cmp—compares two files
- cp—copies one file to another
- crypt—- encrypts or decrypts a file using a key
- dc—reverse Polish notation desk calculator with arbitrary precision
- dd—file conversion utility (it even speaks EBCDIC)
- dump—file backup utility
- echo—writes its arguments to standard output
- ed—standard text editor
- find—locates files that meet specific selection criteria
- graph—draws a graph
- grep—searches a file for a pattern
- ice—a full screen editor designed to work with a DEC VT-52 or VT-100 terminal
- ld—a loader or linkage editor that combines several object programs into one
- lex—generator of lexical analysis programs
- lint—a C program verifier
- ls—lists contents of a file directory
- make—manages program system updates
- mv—moves (renames) a file
- ned—a page oriented text editor
- nroff—text processor or formatter
- od—octal, hex and character file dump
- pr—prints file
- ps—shows status of processes in the system
- ratfor—a rational (structured) dialect of Fortran
- rm—removes a file
- roff—text processor or formatter
- sed—batch oriented editor
- sort—file sort/merge
- spell—finds spelling errors
- split—splits a file into pieces
- stty—sets up terminal options
- tail—prints the last part of a file
- tbl—formats tables for text processing
- tr—copies a file with selective character translation
- troff—text typesetter
- wd—counts lines, words and characters in a file
- write—writes a message to another user's terminal
- yacc—table generator for compilers

This list does not include the little programs you might expect (like who, a program that tells you who is using the system). The general rule with Unix is: If it's generally useful, it has probably been done, and if it hasn't it should be easy. Again, this is because Unix has been in use long enough so that needed utilities have been written and, generally, have become part of the package.

The C Language

One thing that I have mentioned but not addressed is the language C. Unix is written in C and much of the system is designed with the C programmer in mind. C is a more or less structured cross between assembly language and Fortran—it could be thought of as what Pascal would have been had it been designed by a systems programmer instead of a professor. It offers the flow controls

of structured languages (while, do...while, if...then...else as well as goto).

C provides for high-level data definition in the form of structures and arrays. Many data manipulations generally handled in high-level languages such as string move and input/output, are actually not part of C but are handled by the library routines. For the systems programmer, the increment and decrement operators (++ and --) make more sense than the conventional "add one to A and save it in A" (A=A+1) of Basic and Fortran.

On the negative side, C gives you enough rope to hang yourself. If, for example, you want to add 1 to a variable defined as a character in Pascal, you must convert the character to an integer. C has no such qualms about adding an integer to a character.

For the sophisticated user, C offers the advantage of not getting in the way. For the beginner, the handholding of Pascal can be an advantage.

Advantages and Disadvantages

Now we will look at some of the advantages and disadvantages of Unix compared to common operating systems such as CP/M and Flex. One advantage of Unix should be obvious. There is a wealth of professionally written, debugged software that comes along with the package. Another advantage is that Unix allows several users to share the computer system.

The major disadvantage is cost. This is not just the cost of software but also the cost of the supporting hardware. Unix with full source code from Bell Labs costs between $20,000 and $50,000. Various versions are available for the PDP-11 and VAX-11 computers.

For 16-bit microprocessor users, more flavors are becoming available every day. The most well known is Microsoft's Xenix, a full Unix with some enhancements.

Companies such as Fortune Systems and C.M. Technologies are offering single and multiuser 68000/Unix systems ranging in price from $5000 to $20,000.

Hardware cost must also be considered. About 5 million bytes of disk storage is required just to support the Unix overhead consisting of all the utility programs, compilers and swap and scratch space. As the number of Unix installations increases, the cost of the software will decrease. Disk storage cost per byte has been steadily dropping and the 5 megabyte overhead should be less significant in the future.

A third cost consideration is training. If time is money, then you could spend a lot of money learning to use the features of Unix. If it took you a month to learn the ins and outs of CP/M, it will probably take you a year to have a comparable knowledge of Unix.

The advantage, however, is that because of the sophistication of Unix it probably will not be necessary to attain that same level of knowledge. Many tasks that require you to write programs under CP/M can be done by existing utility programs or shell procedures under Unix.

[Editor's note: CP/M users who do not have 16-bit machines can still experience a Unix-like environment on their CP/M-based systems. Software products such as Unica, produced by Knowlogy (under $100 by itself and under $200 in a package with the XM-80 language) bring many Unix features to CP/M.]

Within the next few years multiuser systems will be predominately 16- or 32-bit micros running Unix and Unix derivatives. I predict this not because Unix is the answer to all problems but because it is here today. CP/M was written as a test bed for a PL/M compiler. It has become the de facto standard because it was there, not because of its sophistication.

Unix is here today with capabilities that would take tens and possibly hundreds of man-years to reproduce. Even if a company was willing to invest the money to create a better operating system it wouldn't be available for years.

The big change could be that the average Unix user of the future will be less sophisticated. Many of those users will only know how to log in. The combination of Unix capabilities and fancy applications programs will guide them to what they need.

If a multiuser computer system is in your or your company's future, now is a good time to look into Unix. If you are looking for a way to make money writing good applications software, look into Unix.■

See List of Advertisers on page 146

Getting Down to Business With Local Area Networks

Read why businesses view localized computing power as an essential part of their future office plans.

By John Torode

Much attention has been given lately to the concept of local area networks, in which each user has a computer but shares common peripherals and a common database with other users. Digital Microsystems has been working with this technology for over two years and has over 900 installations up and running worldwide.

The main reasons for the growing interest in local networking are plummeting costs of microcomputer power and increasing recognition of the benefits of multi-user systems. Users of the HiNet network, for example, can link up to 30 Z-80-based workstations—each with 64K bytes of memory and costing only $2000 each—for a variety of business and industrial applications.

When we began exploring approaches to multi-user systems, local area networking—or what is perhaps more aptly called distributed data processing—was a logical choice for us. We felt it made no sense to time-share a $5 Z-80 microprocessor. Companies developing single-processor multi-user systems were putting additional memory on their systems to support more users. Each user got a dedicated 64K bytes of programmable memory, but shared the Z-80 chip. This scheme not only makes little sense in terms of cost, it presents reliability and security problems as well.

Once we made the decision to localize computing power at the workstation level, we began looking at various interconnection schemes, including contention, token passing, and master/slave polling networks. We also considered such networking alternatives as broadband, Ethernet and even RS-232.

> Five years from now I envision a networked computer on every desk, used to transmit and receive documents.

Eventually we settled on a master/slave polling scheme with RS-422 electrical specifications using a twisted-pair cable, which is a baseband approach. The system is a packet-switched network using synchronous data link control (SDLC) protocols.

Our network band width is admittedly narrower than that used in an approach such as Ethernet's, another baseband system, but our cost is far less. For many applications, our ratio between performance and cost is highly desirable.

Future Trends

Over the next few years, we will see considerable development in networking. Ethernet will become a powerful force in the industry, with a substantial drop in cost. Similar progress will be made in broadband nets, which produce much wider band widths, and are useful with high data-rate devices such as on-line video.

As local area networking becomes more common, we will see applications shifting from accounting—general ledger, payroll, accounts receivable and payable—toward total electronic automation of paperwork. This issue of office productivity is being addressed from many quarters.

Five years from now, I envision a networked computer on every desk, used to transmit and receive documents. This will happen because most business telephone transactions are of an inquiry/answer nature. Here actual person-to-person contact is both unnecessary and extremely time-consuming.

By contrast, if I can send a message to your workstation, you needn't even be there to receive it. You can look it up and reply at your convenience.

A direct result of this shift in emphasis will be an increasing need for standards. If you're running on Ethernet and I'm using HiNet, we'll need to pass information using a common format. Unfortunately, I'm not optimistic about such standards being readily adopted, except on a *de facto* basis. Not only do standards' committees traditionally work slowly, but, in addition, the number of manufacturers makes the issue politically sensitive.

Finally, I see applications software as the key to growth in this whole area. Ultimately, it won't matter what kind of network you're running—Ethernet or HiNet, baseband or broadband—applications software will be the limiting, as well as liberating, factor. ■

John Torode is president of Digital Microsystems, 4448 Piedmont Ave., Oakland, CA 94611.

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Survival Kit For Printer Buyers (II)

Epson's twin entries in the printer market—the MX-80 and MX-100—are competitively priced, easy to use and steady in performance.

By Jim Hansen

This month we'll look at the two printers offered by Epson, currently the leading importer of Japanese 80-characters-per-second printers. The MX-80 is an 80-column printer, and the MX-100 prints a 136-column line. Since the MX-80 was previously reviewed in *Microcomputing* (see Aug. 1981, p. 48), it will be discussed here only for comparison.

The mechanics of the two printers are nearly identical, except that the MX-100 has been stretched to provide for wider paper. The paper stepper motor is coupled to the platen/tractor mechanism via a system of plastic gears. The platen in the MX-80 is formed by a bar of extruded aluminum; the MX-100 uses a rubberized roller and other idlers for handling single sheet or friction feed roll paper. The tractors on the MX-100 are part of a subassembly that can easily be detached from the printer when they might interfere with single sheet loading.

The head is driven via a stepper motor coupled to a timing belt with a stepdown gear. The ribbon drive is made up of a series of gears taking power from the head drive. A single factory-set adjustment provides proper alignment of the gear train. Most of the gearing in these two printers is of injection-molded construction.

The head stepper motor is driven in a closed-loop configuration. An optical encoding system using a slotted disk mounted on the motor shaft provides position information to the controller.

The controller electronics and power supply for the two printers are identical. The main differences are the added fan in the MX-100 and the obvious differences in the read-only memories.

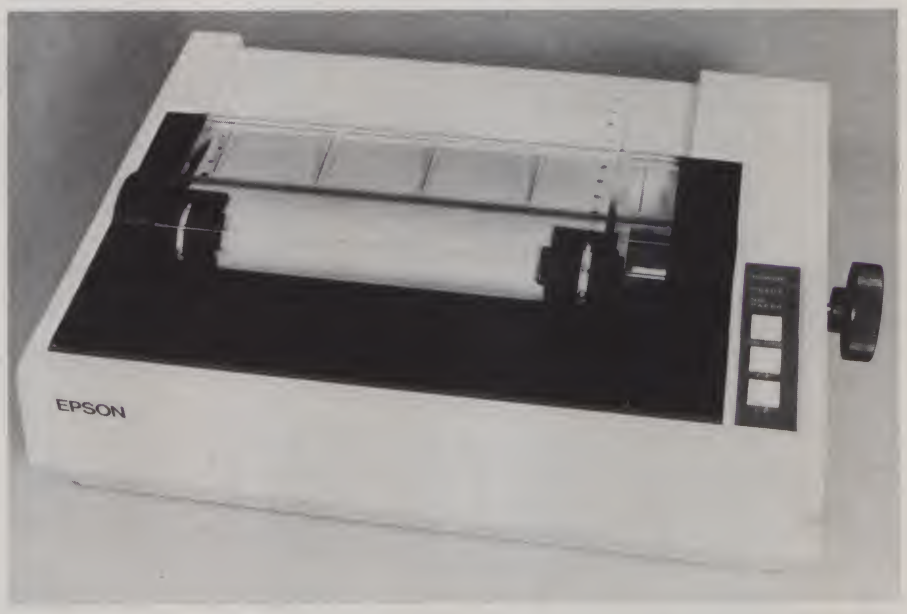

Photo 1. User view of the MX-80. Except for the plastic window, it is nearly identical with the MX-100, a stretched version of it.

The controller is microprocessor-based and built on two printed circuit boards, one of which rides piggyback on the other. The boards are made of paper-phenolic like material (rather than more expensive fiberglass) and you will find no gold on the connectors. All boards are double-sided with plated through holes.

The smaller board, which rides on top, contains mostly the power transistors and drive logic for the printer mechanism. The larger board, which mounts to an aluminum baseplate, contains the power supply rectifiers, filters and regulators; an 8049 single-chip microcomputer controls the head stepper motor and an 8041 controls I/O and the rest of the printer. The power transformer and ac line filter are mounted on the right side of the printer. The photographs reveal that the MX-80 has a single 2332 ROM (4K bytes of firmware), and the MX-100 has three 2716s (6K bytes), reflecting the extra space needed for increased functionality.

These printers are extremely modular. The modules include the case bottom, the printing mechanism, the

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Photo 2. User view of the MX-100. The smoked-brown window is hinged at the front of the case. It is dark enough that program listings cannot be read until they clear the window. All printer controls, switches and connectors are identical to those of the MX-80.

electronics base assembly (which includes the transformer, power switch and line cord), the two controller boards and the cover, which contains a small PC board with the operator control switches and indicator lights. The modules are mounted on the base with screws, and are interconnected with cabling that is usually hand-wired, rather than mass-terminated.

Printer Features

The MX-100 features a single font and can be programmed to provide several character densities; normal density is ten characters per inch (CPI), condensed is 16.5 per inch and enlarged is five CPI. It is possible to print enlarged-condensed characters at about 8.25 characters per inch. (See the print samples.)

Another print mode is emphasized printing, which fires the head solenoids twice for each dot. This will slow the print rate by half but, as the print samples show, further increase the versatility of the printer. No provision for proportional spacing has

```
10 REM TEST TO DETERMINE PRINT SPEED
15 CLEAR 1000
20 A$="THIS IS A SHORT LINE  "
30 B$="HERE IS A LINE OF MEDIUM LENGTH, 42 CHRS  "
40 C$="THIS LINE IS LONG, A FULL WIDTH LINE (WELL, ALMOST )  IT IS THE SLOWEST ONE  "
50 REM
55 REM INPUT FOR OPERATOR DELAY
56 INPUT Z$
60 REM
70 REM  THIS TEST IS FOR SHORT LINE PRINT SPEED - 100 LINES
80 REM
90 FOR N=1 TO 100 LPRINT A$  NEXT N
100 REM
110 REM DELAY FOR OPERATOR
120 INPUT Z$
130 REM
140 REM THIS TEST IS FOR MEDIUM LINE PRINT SPEED - 100 LINES
150 FOR N=1 TO 100 LPRINT B$ NEXT N
160 REM
170 INPUT Z$
180 REM
190 REM THIS TEST IS FOR LONG LINES - 100 LINES
200 REM
210 FOR N=1 TO 100 LPRINT  C$   NEXT N
220 REM
225 INPUT Z$
230 REM
240 REM THIS TEST IS FOR MIXED LINE LENGTHS
250 REM
260 FOR N=1 TO 33 LPRINT A$ LPRINT B$ LPRINT C$  NEXT N
270 REM
280 REM
285 INPUT Z$
290 REM THIS TEST IS FOR RANDOM LINE LENGTHS
300 FOR N=1 TO 100
310 ON RND(3) GOTO 400,420,440
320 NEXT N
330 END
400 LPRINT A$ GOTO 320
420 LPRINT B$ GOTO 320
440 LPRINT C$ GOTO 320
```

Listing 1. The program used to test throughput. The printer was set for normal printing (ten characters per inch) during the tests.

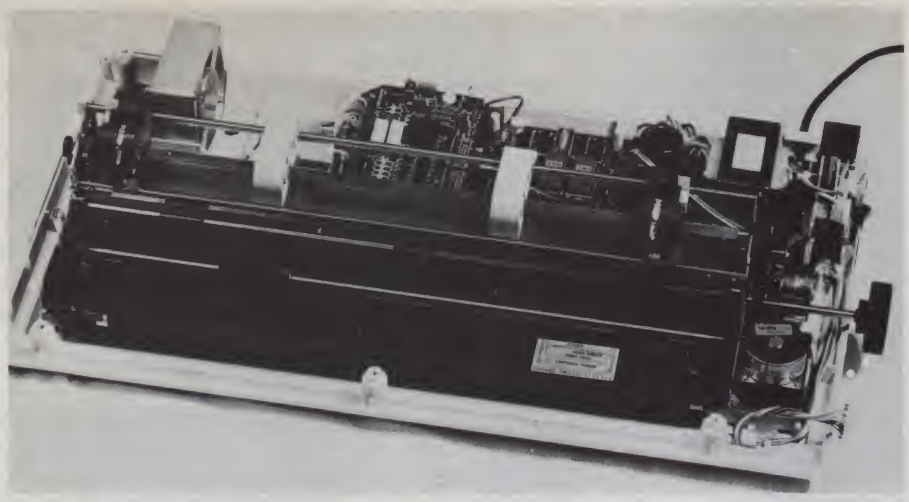

Photo 3. The MX-100 with top cover removed. The interior is nearly identical with the MX-80's except for the addition of the fan, located near the back left corner. The ribbon cartridge stretches nearly the full width of the printer across the front apron. The head stepper motor is visible just below the manual paper-feed knob on the right side of the printer. The MX-100 features a rubberized roller platen to handle single sheet paper. The MX-80, as shown in Photo 8, prints on a metal bar.

been made.

The MX-100 also has eight character sets, providing seven for various European countries, plus U.S. ASCII. The character sets are switch-selectable for power-on default, and can also be accessed by the host computer for bilingual (or should we say octalingual?) printing.

Form lengths can be programmed

```
1 REM
5 REM PROGRAM TO PRODUCE PRINT SAMPLES ON THE MX 100 PRINTER
6 CLEAR 1000:REM SAVE SOME STRING SPACE
10 LPRINT CHR$(18);CHR$(20);:REM SET FOR NORMAL PRINT
15 LPRINT "NORMAL PRINT, 10 CPI"
20 GOSUB 500:GOSUB 500:LPRINT
30 REM SELECT ENLARGED PRINT
40 LPRINT CHR$(14);"ENLARGED NORMAL PRINT".
50 GOSUB 600:GOSUB 600:LPRINT
55 REM
60 REM SELECT CONDENSED PRINT
65 LPRINT CHR$(15);"CONDENSED PRINT"
70 LPRINT CHR$(15);:GOSUB 500:GOSUB 500:LPRINT
80 REM SELECT ENLARGED, CONDENSED PRINT
90 LPRINT CHR$(14);"ENLARGED, CONDENSED PRINT"
100 LPRINT CHR$(14);:GOSUB 500:LPRINT CHR$(14);:GOSUB 500:LPRINT
110 REM PUT PRINT BACK TO NORMAL MODE
120 LPRINT CHR$(18);CHR$(20);
130 REM SELECT THE EMPHASIZED PRINT MODE
140 LPRINT CHR$(27);"E";
150 LPRINT "EMPHASIZED NORMAL PRINTING"
160 GOSUB 500:GOSUB 500:LPRINT
170 REM SELECT ENLARGED MODE
180 LPRINT CHR$(14);"ENLARGED, EMPHASIZED PRINT"
190 GOSUB 600:GOSUB 600:LPRINT
200 REM SELECT CONDENSED, EMPHASIZED PRINTING
205 LPRINT CHR$(15);"CONDENSED, EMPHASIZED PRINT"
210 LPRINT CHR$(15);:GOSUB 500:LPRINT CHR$(15);:GOSUB 500:LPRINT
215 REM
220 REM SELECT EMPHASIZED, CONDENSED, ENLARGED PRINT
230 LPRINT CHR$(14);CHR$(15);"ENLARGED,CONDENSED EMPHASIZED PRINT"
240 LPRINT CHR$(14);CHR$(15);:GOSUB 600:LPRINT CHR$(14);CHR$(15);:GOSUB 600:LPRINT
250 LPRINT CHR$(27);"F":REM RETURN TO NORMAL PRINT MODE
260 PRINT "END OF PRINT SAMPLES"
490 END
500 REM PROGRAM TO OUTPUT ONE LINE IN THE SELECTED MODE
510 FOR N=33 TO 127
520 LPRINT CHR$(N);
530 NEXT N
540 LPRINT
550 RETURN
600 REM PROGRAM TO PRINT A FOLDED LINE OF ENLARGED PRINT
610 REM THIS IS NECESSARY BECAUSE THE MX 100 REPROGRAMS ITSELF
620 REM TO NORMAL PRINT AT THE END OF A LINE PRINTED IN THE
630 REM ENLARGED MODE, EVEN IF THE  LINE ENDS BY OVER RUNNING
640 REM THE RIGHT MARGIN OF THE PRINTER BY ACCIDENT
650 LPRINT CHR$(14);
660 FOR N=33 TO 90
670 LPRINT CHR$(N);:NEXT N:LPRINT
680 LPRINT CHR$(14);
690 FOR M=N TO 127
700 LPRINT CHR$(M);:NEXT M:LPRINT
710 RETURN
```

Listing 2. This program was used to produce the print samples shown in Fig. 1. Notice that the printer cannot print enlarged, condensed, emphasized print, and defaults to enlarged, emphasized instead.

↙ See List of Advertisers on page 146

in either whole inches or lines. Skip length can be programmed by number of lines (e.g., to automatically skip ten lines at the end of a form). Vertical line spacing can be programmed in 1/72 inch increments, up to 85/72 inches. Standard control codes such as form feed, backspace (this removes the last character received from the print buffer) and line feed are recognized and processed in the normal manner.

The MX-100 offers a bit-mapped graphics mode. The dot densities are 816 dots per line (normal) or dual density of 1632 dots per line. This corresponds to about 61 or 122 dots per inch, respectively. Vertical dot spacing is 1/72 inches. The programmable dot density feature is useful when exceptionally fine resolution graphics are required, but naturally, it halves the rate at which the head travels.

The graphics mode is selected by an escape sequence consisting of four bytes: the ASCII escape character, the letter K and two bytes that in hexadecimal define the number of graphics characters to follow. The printer outputs eight dots for every byte sent to it in the graphics mode. It does not provide wraparound should your line be too long. The graphics mode is cancelled at the end of the line, or when the specified number of graphics characters have been sent to the printer.

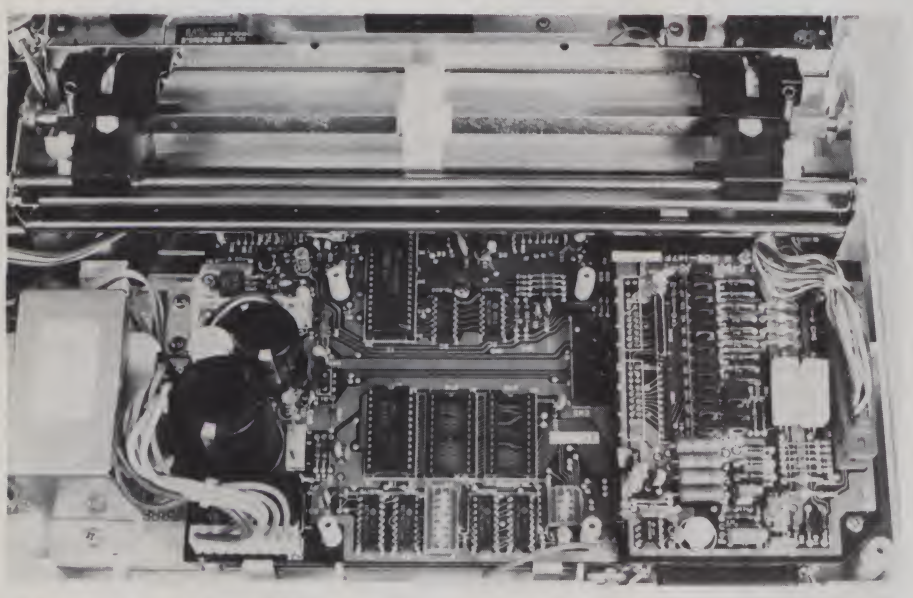

Photo 4. Back view of the MX-80 showing the power supply on the left. The main controller card contains the microprocessors, power supply and interface connectors. A piggy-back board rides on top of the main card above the interface connector on the right side of the photograph. It contains the high current drivers for the printer subassembly.

Paper

The MX-100 can take nearly any

kind of paper on which you might want to print. Since it is equipped with friction feed, it can print on letterhead or roll paper, rather than the usual perforated stock required by most low-cost (and many more-expensive) printers.

The tractor mechanism can be easily removed if it is in the way or not being used. It is adjustable for nearly any form width. The individual sprockets have a positive locking lever which makes paper width adjustment particularly easy. A software-initiated mode defeats the normal paper-out sensor for use whenever single-sheet paper is being printed. (This stops the printer from going off-line when the paper is pulled from the printer.)

Programming the Printer

The MX-100 responds to a number of control codes and can be programmed by escape sequences. In all, it will respond to 14 control characters, which include sounding the bell (actually a buzzer), backspacing over a character, tabbing, shifting print sizes, selecting and deselecting the printer and performing form feeds, line feeds and carriage returns.

Escape sequences, many of which are rather involved, allow programming of line spacing, setting horizontal and vertical tabs, setting form and skip lengths, selecting emphasized printing, graphics mode, setting column length and selecting one of the eight available character sets.

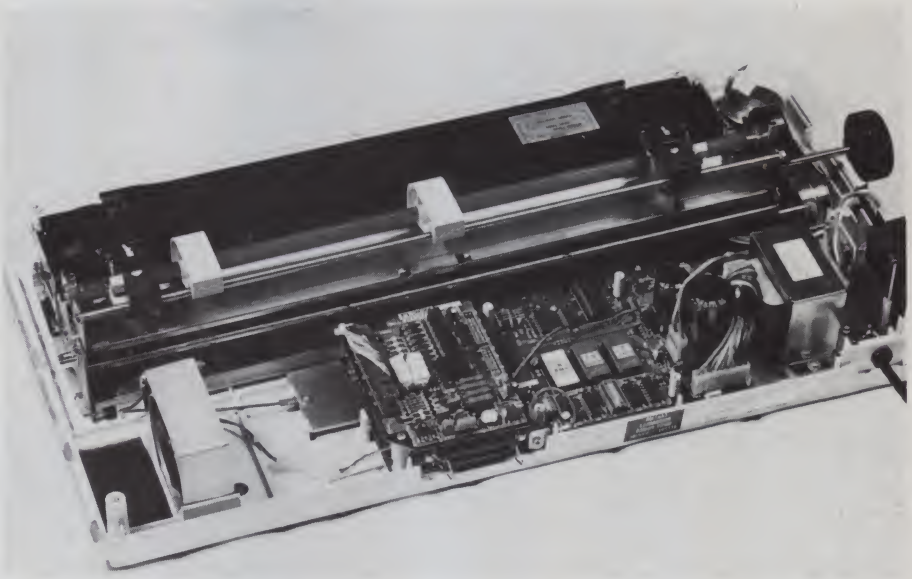

Photo 5. Back view of the MX-100. The layout (and controller cards) are identical with the MX-80 except for the addition of the fan. Notice that the MX-100 uses all three ROM sockets, but the MX-80 fills only one. The two optional DIP switches are located between the back rail and the middle ROM chip, and next to the back apron of the right hand ROM.

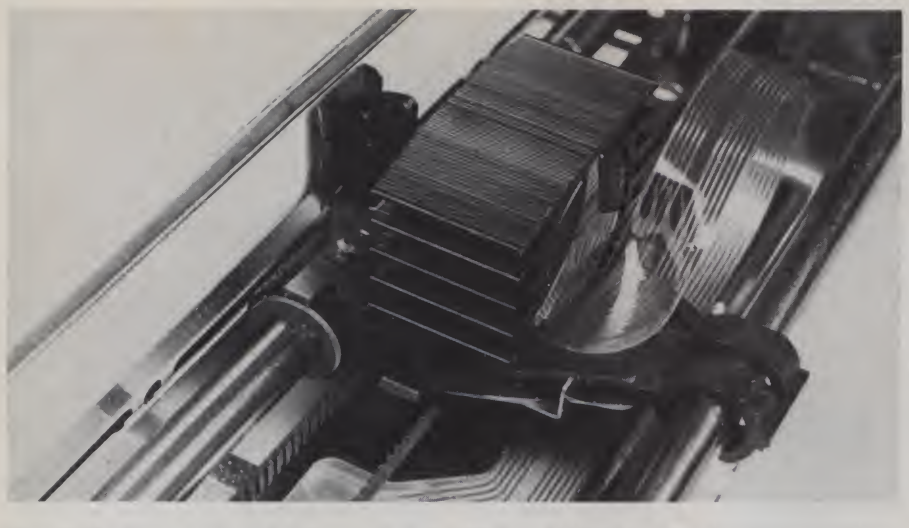

Photo 6. The throw-away printhead used in both the MX-80 and MX-100 printers. Note the integral heat-sink used to prevent overheating.

Manual

When my MX-100 first arrived it came with a poorly-written, very Japanese manual that had numerous penciled corrections, misspellings and crossouts. It was written in especially fractured English. A couple of weeks later it was replaced with an 84-page manual, a nicely printed and corrected version of the same book.

The 84-page user's manual is reasonably complete and has many diagrams, charts and tables that explain how to use the printer. Six appendixes provide a very brief theory of operation, parallel interface definition and operation, options for the printer, an ASCII table, a dot map of the character font, and on the very last page a complete abbreviated listing of all the control codes and escape sequences recognized by the printer.

Tests

I ran the MX-100 through the same series of tests for throughput that were used for the review of the Centronics 739 printer (May 1982, p.40), and wrote another program to provide print samples (shown in Fig.1).

Noise

I measured the noise of the MX-100 at 71–73 db, slightly quieter than a Selectric typewriter.

Subjective Analysis

This printer is typical of Japanese products marketed in the U.S. It has attractive, clean lines, good electrical and mechanical engineering and is priced very aggressively.

I found the printer to be exceptionally easy to use as far as paper loading, cleaning, cable hookups and the like are concerned.

I did not like the plastic window; it is a smoked-brown color, and prevents you from reading the output as it is being printed. This is difficult with the cover off anyway. Since the window is hinged at the front of the printer, it is in the way when paper is changed. Fortunately, it can easily be removed.

There are no paper guides for sheet paper, and I was not able to locate the margin guide marks called out in the manual. Each sheet has to be carefully positioned by hand to keep the margins set and the print parallel with the edges.

The fan in the MX-100 is not especially loud, but it becomes more of a nuisance as the day wears on. I don't understand why it is needed in the MX-100 when it was not used in the smaller, more cramped MX-80. Normally, opening up more case space reduces the need for forced air cooling.

Several operating features were particularly annoying to me. It takes

```
NORMAL PRINT, 10 CPI
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

ENLARGED NORMAL PRINT
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

CONDENSED PRINT
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

ENLARGED, CONDENSED PRINT
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

EMPHASIZED NORMAL PRINTING
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

ENLARGED, EMPHASIZED PRINT
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

CONDENSED, EMPHASIZED PRINT
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

ENLARGED,CONDENSED EMPHASIZED PRINT
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
```

Fig. 1. Print samples from the Epson MX-100. The printer has three character densities: normal (10 characters per inch), condensed (16.5 characters per inch) and enlarged-condensed print, about eight characters per inch. Enlarged printing simply prints two dots for every dot normally printed. Emphasized printing double-strikes each dot printed, overlapping the dots to produce a more attractive output.

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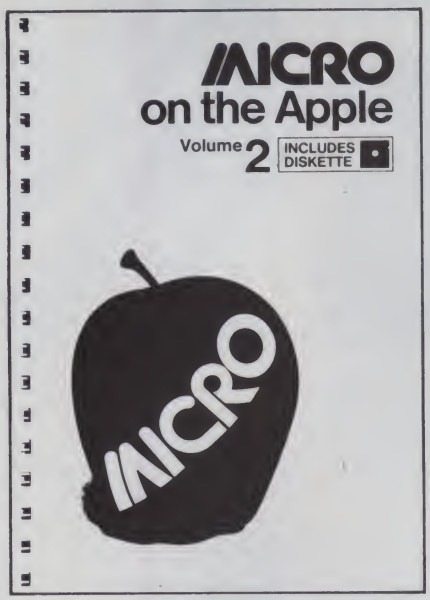

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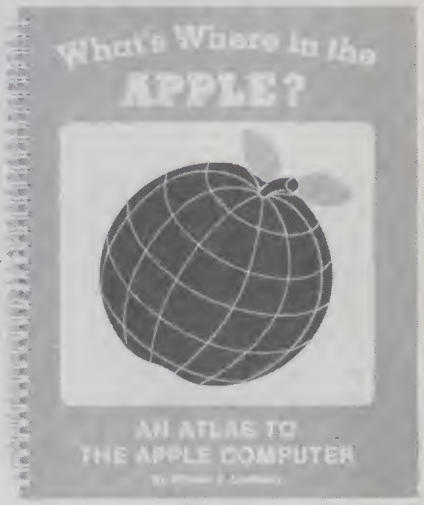

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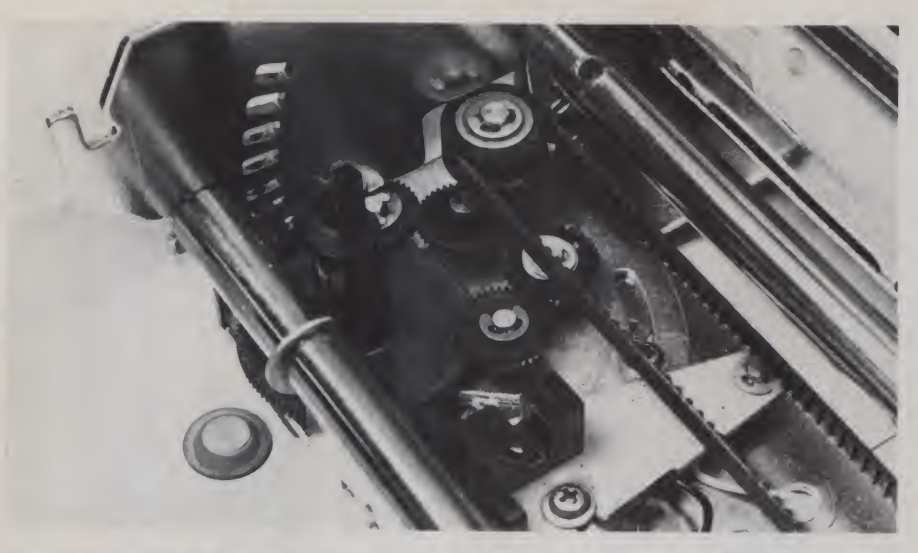

Photo 7. The ribbon drive mechanism is a system of injection molded plastic gears. The head belt supplies power to the gear nearest the belt pulley. This gear flips between the two adjacent gears depending on which way the head is moving. The result is that the ribbon is driven regardless of the direction of head travel. The head home sensor is shown in the foreground of the gears. The ribbon gears and home sensor each have a single factory set adjustment. The prudent owner will not tamper with either setting.

	Time for 100 lines (seconds)	Characters Printed	Throughput (Characters per second)
Test 1— Short Line (21 characters)	62	2100	33.87
Test1— Medium Line (42 characters)	88	4200	47.72
Test 3— Long Line (75 characters)	133	7500	56.39
Test 4— Mixed Lines, fixed order (99 lines printed)	118	4554	38.59
Test 5— Mixed Lines (random order)	116	4596	39.62

Table 1. Throughput measurements for the Epson MX-100. Overall, it is slightly faster (a few characters per second) than the Centronics 739, reviewed earlier and tested with the same program. The program used to test throughput is shown in Listing 1. The times above were obtained when the printer was set for ten characters per inch.

ten seconds to formfeed 11 inches. Horizontal and vertical tabs, as performed on this printer, are no faster than sending out spaces and line feeds.

The printer will switch or modify modes for you automatically. For example, if you want to print enlarged, condensed-size characters (a good size for captions or headings), you set up the printer by sending:

```
110 PRINT CHR$(15);CHR$(14);
```

Then you send the data you want printed. The problem is that every time the end of a line comes about, the printer drops the enlarged mode, leaving only condensed. This means that you must precede every line with the enlarge command, CHR$(14).

Here are some other things you *can't* do:

1. You can't intermix normal and condensed type on the same line.
2. You can't emphasize (double strike) in the middle of a line. (The whole line is emphasized regardless of where the emphasize code is placed.)
3. You cannot emphasize condensed, enlarged printing. The result is that all print will be enlarged. (The manual didn't mention this restriction.)
4. There is no good way to provide super- and subscript capability.
5. You can program for form lengths only in whole inches or lines.

Although it is obvious that Epson has made a tremendous effort to provide a good manual, programming instructions are still not clear. The manual consistently talks about hexadecimal, decimal and binary numbers almost interchangeably. There are very few programming examples, and most of the ones provided relate only to the graphics mode.

After reading and rereading the manual, I still had trouble programming the printer to perform the way I wanted on the first try. But once the printer is programmed, it responds just the way it should. However, since it will not tab or form feed any faster than spacing or linefeeding, it might be simpler to keep these functions in the driver software rather than trying to let the printer perform them.

The manual has diagrams and charts on nearly every page, and I especially liked the control code reference table at the end of the book. This

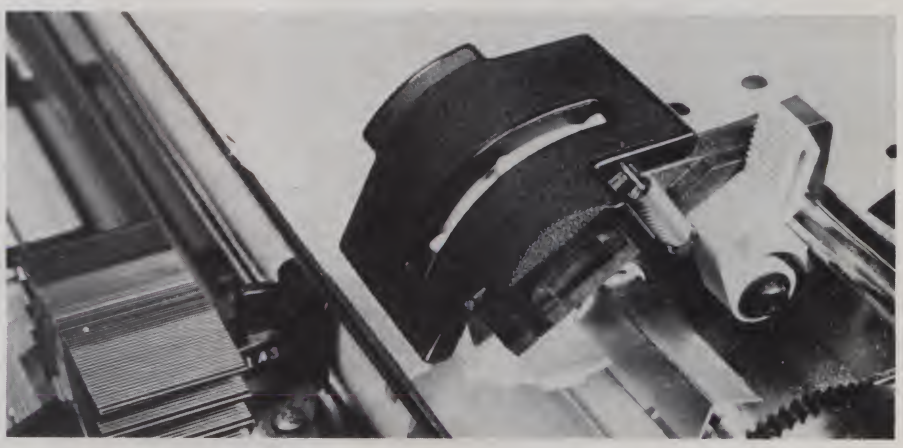

Photo 8. The tractors on the MX-80 and MX-100 are similar. Symmetrical design allows the same components to be used on either the left or right side. The tractor locking lever is positive, yet requires very little force to lock or unlock. This photo also shows the MX-80 metal platen, just visible to the right of the paper.

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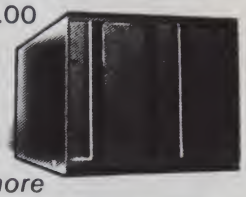

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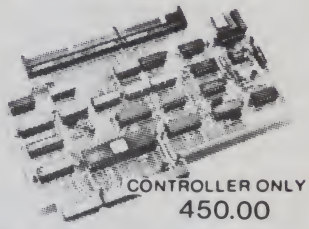

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makes it easy to find the code you are looking for, and gives a reference page number in the manual if you need more information.

I found the printer performance to be very disappointing. The paper handling and head positioning are unreasonably slow. This printer is not well-suited for text processing unless a "smart" output controller is used to handle justification, underscoring (a nearly universal problem in low-cost printers) and super- and subscripting. The printer cannot proportionally space text at all.

Print quality on the MX-80 is better than the MX-100. This is because the head rails of the MX-100 have resonances, which you can hear as the head moves along; they result in "wavy" characters, which are visible in the print samples from about the capital A to U of the enlarged-condensed print, and can also be seen elsewhere in the print samples. The effect is dependent on the data being printed, the position of the head on the rails, and other manufacturing variances. The rails should have been made of stiffer material (larger diameter) rather than the same size used on the shorter MX-80.

I did not like the way the printer is programmed. Nearly every function is programmed differently, so there is no common format and each escape sequence has to be learned separately. The rather bizarre graphics implementation forces the host computer to look ahead and see how many graphics characters are to be sent, then tell the printer. If a calculation error gives the wrong number, graphics data can end up being printed as text or vice versa. Since the Epson printer expects eight bits of graphics data, users with seven-bit printer interfaces (such as Apple's Centronics printer interface) will have to reprogram the printer so that the vertical

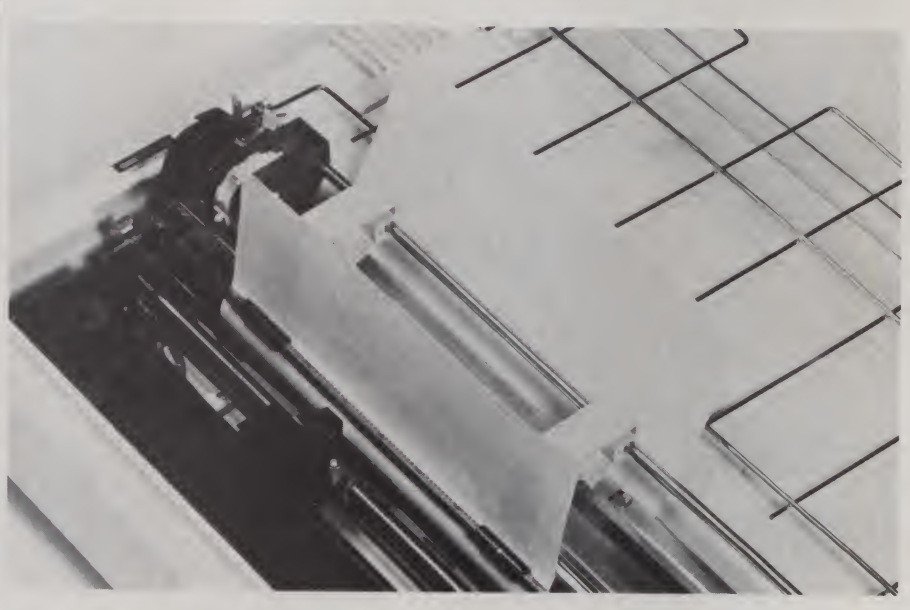

Photo 9. The MX-100 can also print on single sheet paper. Most users will want to leave the window off, since careful manual alignment of each sheet is necessary. There are no paper guides on the printer for single sheet paper.

Photo 10. The MX-100 ribbon is just like the MX-80's, except longer. Ribbon loading on both printers is quick and easy. You will not get messy fingers either.

spacing will allow seven dots per line. This will naturally mess up the number of lines per inch printed in text mode.

Epson made several bad choices for programming command structure. For example, when horizontal tabs are programmed, the sequence must end in an ASCII null character. (A better command terminator might be a carriage return. Nulls are sometimes hard to send due to output firmware in computer systems and many systems use them as timing fill characters.) Further, this printer wants single (and sometimes double) bytes of binary data to transfer parameters. For example, to program a horizontal tab at print position 10, you must send it the equivalent of:

```
10 PRINT CHR$(27);"D";CHR$(10);CHR$(0)
```

I was also disappointed to find that various print modes cannot be intermixed on a single line. For instance, emphasized and condensed text are not compatible and the printer can lose data if these commands are mixed with each other on the same line. In both of these cases, the entire line, not just data following the command, is printed in the selected mode. This makes it difficult to use either for emphasizing words in a line of text.

> At the price,
> they will probably
> be winners
> regardless of performance.

No review of the Epson product line would be complete without comment on the disposable head. My comment is that as far as I am aware, every manufacturer of dot matrix printers provides disposable printheads. (Who wants a worn out head anyway?)

Conclusions

Overall, what did I think of the MX-100, and would I recommend it? It seems like a nice product, but is disappointingly slow. Many of the features would be just as well implemented by the host, and several others have restrictions that make them less than useful. The printer produces good, clean print except for occasional waviness. I especially liked the ten CPI emphasized print. The printer is not well-suited to text processing applications unless considerable host preprocessing of the text is performed. The printer has the highest horizontal graphics registration of all low-cost printers, but only average vertical density. The graphics mode is unusually cumbersome to use.

The printer is available by mail order at considerably less than the $999 retail price. This boon to the consumer will probably result in poor service since most retailers will end up selling ribbons but no printers.

If you need a printer that can handle 15-inch forms and occasionally print on letterhead stock, this printer may be of interest to you. However, if text processing final output is what you have in mind, you should be aware that the MX-100 is not well-suited to this task.

The MX-80 and MX-100 are slow (about 35 cps throughput) printers that have been designed for light duty. But at the price they can be purchased for today, they will probably be winners regardless of performance.■

↙ See List of Advertisers on page 146

Apple Screen Gets a New Look

Give your eyes a break while coding or editing programs on your Apple II with this reverse video output program.

By Larry Abrams

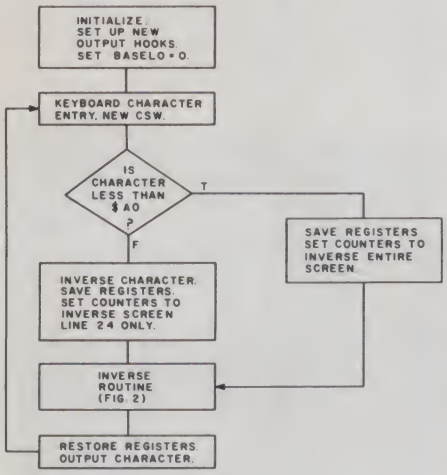

Fig. 1. Program flowchart.

Did you ever wish your Apple II could inverse the screen to generate black characters on a white background? This assembly-language program does exactly that. It's a short (65 byte) program that updates the screen to inverse characters with each key entry. It works with either Basic or the monitor, in immediate or deferred mode. However, inverse, flash and HTab commands and statements are not supported; it was designed to be used primarily as an alternate screen while entering code.

To use the program, first type the object code at the left of the listing, then type BSAVE BLACK ON WHITE, A$300,L$41. It can then be used anytime with BRUN BLACK ON WHITE or BLOAD BLACK ON WHITE, followed by CALL 768.

Two flowcharts accompany the listing. Fig. 1 outlines the entire program, while Fig. 2 is a detailed flow of the inverse routine block in Fig. 1. This block directly corresponds to the label inverse and the following 17 bytes (32A through 33A hexadecimal) in the program.

How It Works

Recall that the primary screen memory locations are 400 to 7FF; it is these addresses we need to keep inverse-updated. They are referenced by using indirect indexed addressing with BASELO (06) and BASEHI (07) as the zero-page base locations in conjunction with the Y register. The effective screen range address is calculated by taking the address indicated by the contents of (06, 07) and adding what is in the Y register. For example, if 06 holds a zero (as it always will in this program), 07 holds a 5, and 50 is in the Y register; then the indexed address is 550. This happens to be the beginning of screen line 19.

To update the entire screen to in-

Program listing. Black characters on white background program for the Apple II.

```
                       1 *********************
                       2 *  Black on White   *
                       3 * <ARIES SOFTWARE>  *
                       4 * (c) Larry Abrams  *
                       5 * V1.0 / 02.01.81   *
                       6 *********************
                       7 *
                       8 ORG      EQU $300
                       9 CSWL     EQU $36
                      10 CSWH     EQU $37
                      11 RWTS     EQU $3EA
                      12 SAVE     EQU $FF4A
                      13 RESTORE  EQU $FF3F
                      14 BASELO   EQU $06
                      15 BASEHI   EQU $07
                      16 COUT1    EQU $FDF0
                      17 *
0300: A9 0F           18          LDA #$0F       ;Set up new output
0302: 85 36           19          STA CSWL       ; hooks to $30F=entry.
0304: A9 03           20          LDA #$03
0306: 85 37           21          STA CSWH
```

More

Address correspondence to Larry Abrams, 522 N. Cascade Terrace, Sunnyvale, CA 94087.

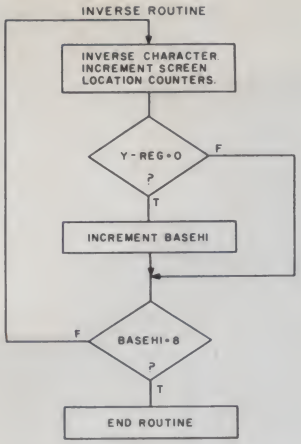

Fig. 2. Flowchart of the inverse routine block.

Listing continued.

```
0308: 20 EA 03   22          JSR RWTS        ;Tell DOS about it.
030B: A9 00      23          LDA #$00        ;Clear low base address.
030D: 85 06      24          STA BASELO
030F: C9 A0      25 ENTRY    CMP #$A0        ;Is key alphanum character?
0311: 30 0E      26          BMI NOTCHR      ;No, so don't inverse it.
0313: 29 3F      27          AND #$3F        ;Yes, inverse it.
0315: 20 4A FF   28          JSR SAVE        ;Save registers for output.
0318: A9 07      29          LDA #$07        ;Only inverse line 24
031A: 85 07      30          STA BASEHI      ; from $7D0 to $7FF.
031C: A0 D0      31          LDY #$D0
031E: 4C 2A 03   32          JMP INVERSE     ;Screen inverse update.
0321: 20 4A FF   33 NOTCHR   JSR SAVE        ;Save key w/o inversing it.
0324: A9 04      34          LDA #$04        ;Set up to inverse
0326: 85 07      35          STA BASEHI      ; entire screen memory.
0328: A0 00      36          LDY #$00
032A: B1 06      37 INVERSE  LDA (BASELO),Y  ;Get char from screen
032C: 29 3F      38          AND #$3F        ; mem loc and inverse it.
032E: 91 06      39          STA (BASELO),Y  ;Put it back inversed.
0330: C8         40          INY             ;Increment index counter.
0331: D0 02      41          BNE SAMEPAGE    ;If counter<>0 then skip.
0333: E6 07      42          INC BASEHI      ;Yes, increment page.
0335: A5 07      43 SAMEPAGE LDA BASEHI      ;Get page to check
0337: C9 08      44          CMP #$08        ; if done (page=8).
0339: D0 EF      45          BNE INVERSE     ;No, still in screen range.
033B: 20 3F FF   46          JSR RESTORE     ;Done. Get registers back
033E: 4C F6 FD   47          JMP COUTZ       ; and output character.
```

verse, BASEHI is set to 04 and Y is 00 as shown by the code at NOTCHR. Typically this is what happens with a carriage return (especially the CR after HOME or VTAB). If the key is an alphanumeric character, then we need only update line 24 to cover a one-line scroll possibility. To do this, BASEHI is set to 07 and Y to DO (7DO is the beginning address of line 24). Then the code at inverse updates either the entire screen or just line 24. It could have been set up to inverse-update the entire screen in all cases, but it would have made the routine prohibitively slow.

Finally after updating the screen, the registers are restored from 45 through 49 by calling the monitor routine Restore at FF3F. The accumulator contents are output via COUTZ. It is necessary to use this output label instead of COUT, since COUT would be hooked to the output routine at 30F (CSWL), and would end up in an infinite loop. The routine is finished and returns control to the monitor where the keyboard is scanned for the next key, as always.■

See List of Advertisers on page 146

H-89 to the Rescue!

If you're still unsure whether a microcomputer is for your small business, read how the H-89 helped a seasonal sporting goods store become a big hit on the slopes.

By Bruce Grubbs

Our store specializes in cross-country skiing, technical mountaineering and backpacking. Due to the seasonal nature of these sports, our sales vary considerably.

About a year ago, I decided to look into buying a microcomputer. I thought it would help us study our seasonal sales patterns, to more accurately place preseason orders. A computer could also handle our mailing list. As a specialty shop, we need to direct our advertising to a small segment of the population. We had been considering implementing a mailing list for several years, but had no desire to set up and maintain a manual system.

At first, I was unsure about using a micro for accounting. We have a relatively simple single-entry system, and I wasn't sure that a computer could make the system more efficient. I quickly discovered how wrong I was.

Selecting a System

My computer background was restricted to exposure to Fortran IV and Basic in high school and college courses, but my amateur radio experience helped. I was immediately impressed by the abilities of many micros on the market, as compared to the mainframe I had worked with in college ten years earlier.

But prices were higher than I had originally thought. The bare bones hobby system would not be enough for business applications; we would need a more powerful system.

Finally, I visited several computer stores in Flagstaff and Phoenix. From some tentative programming, and from a careful analysis of the amount of data we would put on the computer, I concluded that we would require 48K bytes of RAM and at least one disk drive. I tested these conclusions on a micro at the local university, and got a feel for the size of the job I would be facing if I decided to do the programming.

Eventually, I took a close look at Heath's H-89. Heath has a well-deserved reputation for excellent kits, and the savings from building one of their computers is considerable. The H-89 became more appealing as I looked closely at its capabilities. The sharp display was an important factor. I found that several hours of working on some of the other popular micros tired my eyes much more than the H-89.

In looking at the various Basics used on several computers, Heath's Microsoft Basic option was another big plus. You can easily switch disks in a single-drive system under Basic, which would let us start with a single

The Alpineer is a big hit on the slopes, now that is has an H-89.

Bruce Grubbs (406 South Beaver, Flagstaff, AZ 86001) is part-owner and manager of The Alpineer, a small specialty sporting goods shop in Flagstaff.

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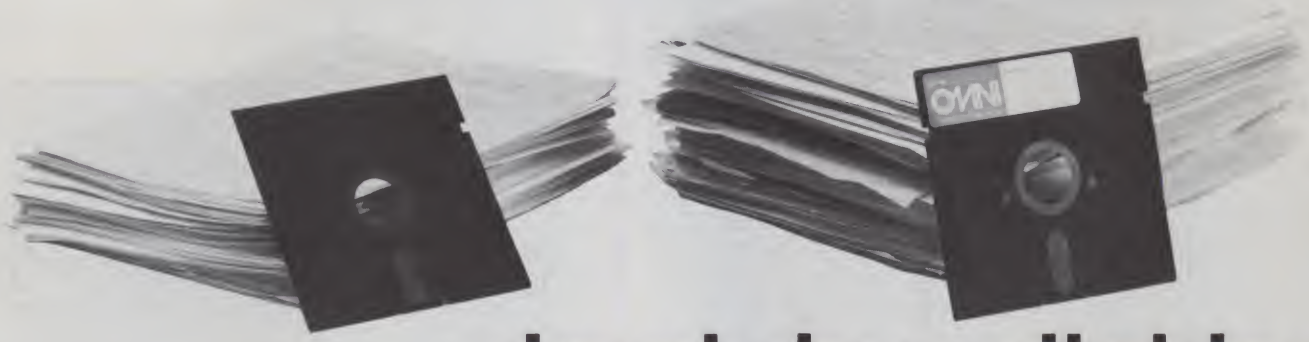

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drive and later expand to 300K bytes with Heath's dual five-inch disk system. We could also add a dual double-density eight-inch system with a capacity of two megabytes. The system as finally bought included the H-89 kit with 16K RAM, two 16K RAM expansion kits, the HDOS operating system, Microsoft Basic and the H14 printer kit.

Assembling the Computer

The H-89 kit is well done. It took me about 25 hours, spread over a three day period, to assemble it; testing and installation of accessories took another four hours. We spent two days assembling the H14 printer, which, unlike the computer, did not work at first. I sent it to the Phoenix Heathkit store, and they fixed it under warranty.

Programming

Now came the programming job. I had decided to do the programming myself partly because of the cost of packaged software, and partly because I wished to adapt the computer to our methods. Since I was familiar with an earlier time-sharing Basic, I learned Microsoft Basic quickly.

The programs would have three main tasks: mailing list maintenance, single-entry accounting and unit sales analysis. This last term deserves some explanation. Due to our small size, we decided that we did not need a formal inventory control. Most of our inventory consists of major items such as skis, tents, sleeping bags and packs. In our shop, it is still easy to determine ordering needs by walking around the store and looking. But, as mentioned earlier, our sales are seasonal. Data on unit sales per month (that is, the discrete number of major items sold in each month) would be very useful in planning orders, especially since we order much of our stock six months in advance.

The system consists of some 35 programs on six disks. The programs are arranged as follows:

- Disk 0—System boot and exit programs.
- Disk 1—Daily update programs for accounting.
- Disk 2—System initialization programs, and mailing list and sales analysis daily update programs.
- Disk 3—Monthly, quarterly and annual accounting close-out and report programs.
- Disk 4—Accounting, mailing list and sales data analysis programs.
- Disk 5—Miscellaneous utility programs.

The operator first boots up disk 0, which puts the master system menu on the display. All options may be selected by means of the master menu, or from a number of submenus of the master menu. The two types of programs in the system are menu and job programs. Program execution control may pass from any menu program only to the menu program used to select it, to another submenu or to a job program. Job programs do specific tasks, and then always return to the calling menu. The modular design of the system let me break up the programming job into more palatable chunks, and also minimized the impact of bugs in a particular module.

The menu-driven arrangement lets the user select operations without being concerned with the name of the program or where it is located on the disks. If a program is selected that is not the disk currently in the drive, the computer resets the drive and requests the new disk by name. Each disk is identified by a unique number so that incorrect disks, or disks which are not a part of the system, will be rejected.

Data Files

All the data files maintained by the system are kept on another seven disks. A program that needs to access a particular data file resets the drive and requests the new disk by name. The disk-numbering system again prevents incorrect disks from being used. The data disks currently in use are Account Balances, Accounts Payable, General Ledger, Mailing List #1, Address File #1, Sales Analysis #1 and Sales Analysis #2.

Disk Space Requirements

One program disk in the system must contain the Heath Disk Operating System (HDOS) and Microsoft Basic (MBasic); this is Disk 0, the boot and exit disk. The other five program disks and seven data disks contain only minimum system software (any disk used in a single-drive H-89 must have this software). The capacity of a formatted five-inch disk is about 100K bytes. After the minimum system software is added, about 270 sectors of 255 bytes each are available, or about 68,850 bytes for program or data storage.

Most of the program disks are slightly less than half-full, containing about 100–125 sectors of program files. The data disks in the accounting portion of the system are even less-full, containing an average of about 80 sectors of data files.

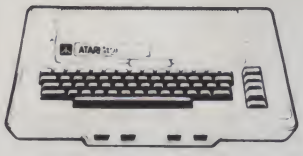
Obviously, I could have packed the data and programs into five or six disks instead of 13. But I felt it would be wise to allow plenty of room for expansion. Since the original programs were finished, I have added a number of new programs, especially for data analysis. Also I've expanded a number of the original programs.

Nearly all of the data files in the system use MBasic's random file access, which is in 255-byte records. I have deliberately not used all of the space in each record to allow for more data to be recorded in later versions of the accounting system, even though there is wasted space in older disk files.

The mailing list, sales analysis and

The computer system. The Heath H-89 with built-in disk drive is on the right, and the H14 printer on the left. The disk file is visible between the computer and printer, and the operating manual is just right of the computer.

ATARI



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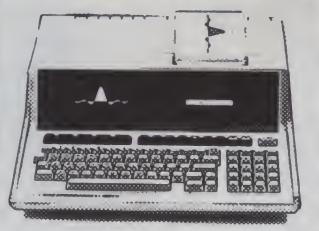

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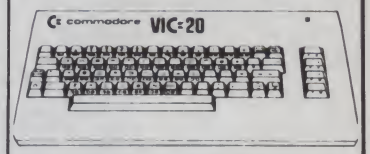

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address file data disks use record space more efficiently to keep access time to a minimum. Some data is on more than one disk, such as the Sales Analysis data, which was filed on two disks from the beginning.

Using the System

The system is menu-driven, and all choices available to the operator are clearly presented in this manner. Incorrect choices are rejected and the operator is asked to try again. When a new disk is required, the program asks for the disk by the name and number.

When a decision must be made by the operator, most programs ask for a yes or no answer in the form "Y" or "N." Occasionally a program presents several numbered choices, like a short menu. Again, incorrect answers are ignored, and the program repeatedly requests an answer until it is correctly supplied.

Data is screened as carefully as possible to eliminate incorrect information. Dates are carefully checked by several subroutines, since an incorrect date could result in lost data, especially in the accounting portion of the system. As appropriate, input dates are checked against the HDOS date (entered during initial boot) and against the date recorded with the last entry of the specific data the operator is working with.

A scroll mode is provided in the terminal section of the H-89, and it is used to make reading of long data displays on the console screen more convenient. Pressing SCROLL advances a new line onto the display, and pressing SHIFT/SCROLL displays a new page of 24 lines.

Update data must be supplied to the accounting, mailing list and sales analysis systems on a regular basis, but does not need to be done daily. Our part-time bookkeeper can thus maintain the system, and can keep flexible working hours. In addition, it is easy for another employee to fill in for the bookkeeper when she is on vacation.

Nearly all possible errors in data entry that are not caught by the programs can be corrected by the operator using the options available on the menus, avoiding any need for me to access the data files directly or use other programming techniques to clear up the problem. Occasional bugs still pop up, but these affect operator convenience rather than accurate operation.

Computer Crashes

I have taken a number of steps to minimize the effect of computer crashes or loss of data files from disk (after six months, neither has occurred). First, accounting summaries are printed at the close of each month, and the summary data is filed on the General Ledger disk. The daily records for that month are erased, and the Account Balances and Accounts Payable disks are used over for the next month. A total computer crash during mid-month would only cause the data for the current month to be inaccessible. Enough data is recorded manually during the month (we use carbon-backed checks which automatically produce written records, for example) so that manual methods of accounting could easily be resumed until the computer was available again.

Such a crash would also deny us access to our mailing list and our sales data, but would not be serious unless the computer was not available for three or four weeks. Even so, the original data is still available in written form, since it is recorded when the customer signs up for the mailing list or the salesman writes out the receipt.

Backup Files

Another potentially serious computer failure is loss of disk files through machine malfunction or by physical damage to a disk. We make backup copies of all the programs and data in the system (and any other important files, such as this article) once a month, or after any major changes in the programs. In addition, printouts are kept for all the programs, though these are not updated as often.

All backup files are made with the Heath-supplied single-drive file-copying routine ONECOPY, which involves switching the source and destination disks a number of times. But since ONECOPY is a stand-alone utility and HDOS is not present in RAM, most of the 48K memory is available for copying purposes. A disk containing 270 sectors is copied in about six swaps, and most of the disks in the system copy in two or three swaps. Second and third drives would certainly speed this process, but are not essential.

All backup disks are kept in a different location, for fire and theft security. The hardware would be much easier to replace than the software and data.

System Documentation

Using the Heath-supplied EDIT utility, I maintain an operating and reference manual on disk and in written form. Using the computer, I have found it fairly easy to keep the documentation up to date. The purpose of the documentation is both to provide operating instructions for the operator, and to provide program listings and file format data for reference when maintaining or modifying the system.

The operating section of the manual details the procedures for starting and shutting down the system, and discusses briefly the functions available to the operator. It also discusses specifically how the operator should respond to questions and requests for data from the programs. A portion of this section deals with program crashes and recovering, and tells the operator what to record when a crash does occur so that I have an idea what to patch. Extensive use of error traps in the programs prevents nearly all

Our bookkeeper entering daily accounting data.

crashes, but when one does occur the operator can refer to the manual for information on using the rest of the system when one module fails.

In the reference section, I have recorded detailed descriptions of the disk contents and file names. A program chart traces the flow of program control between the system modules. Each data file is fully described, and the contents of each field in the random access files are explained. This allows me to design a new program which reads from the data files, without having to examine the program which creates that data file, and ensures that the data will be read by the new program exactly as it was recorded.

Summary

So far, we're finding our new computer system to be of great assistance in the daily operation of our business. Using the sales analysis data, I was recently able to place all of our preseason orders for the spring in about one-third of the normal time. The mailing list is seeing frequent use, and I was certainly wrong about the efficiency of the computer accounting system.

In addition, the machine is being used for a number of smaller jobs, such as preparing price lists. The computer assisted us in recording and computing our annual physical inventory recently, and cut several hours off this late-night chore.

In short, no one in the shop regrets the purchase of the computer, and we're all impressed with its capabilities and utility.■

Closeout of the H-89. Note the numeric keypad at the right side of the keyboard. This makes entry of accounting data much faster.

✓See List of Advertisers on page 146

What's So Difficult About ZX-80 Machine Code?

Even inexperienced users unfamiliar with the ZX-80's inner workings can program—in Zilog Z-80 machine code.

By Loyd W. Redman

When I received my new ZX80, I looked in vain through the operating manual for information on programming in machine code. Finally I found on page 89 these reassuring words: "PEEK, POKE and USR(A) are really facilities provided for very experienced users who understand the detailed workings of the ZX80."

I didn't understand the detailed workings of the ZX80, but I did understand those of the Zilog Z-80 microprocessor. So after several trial-and-error programs, I learned the procedure for programming the ZX80 in machine code.

Since the ZX80 operating manual does not contain a detailed memory map of the 1K bytes of user memory, I was not sure where to locate my machine-code program. However, the manual does state that the first line of the user program is entered in location 16424. Starting at various locations above 16424, I used poke and peek to enter blocks of 0's and determined that you can poke data in 64 contiguous locations before running into the program-variable locations of user memory.

Next I ran the following program in ZX80 Basic:

```
10 FOR I=0 TO 91
20 LET X=PEEK (I)
30 PRINT X,;
40 NEXT I
```

The display screen contained four columns of decimal numbers (none larger than 255) representing the contents of the first 92 memory locations in the ROM (read-only memory). Thus, I determined that the instructions located in ROM are in decimal form.

Suppose you want to run the machine code program shown in Listing 1. First the hexadecimal code instructions must be converted to decimal form. Use the program in Listing 2 to perform hex-to-decimal and decimal-to-hex conversions. I recorded this program on cassette tape. The routine beginning at line 170 converts two-character instructions to decimal form.

I chose memory location 17020 for storing the results of the addition performed by the machine-code program. This location did not interfere with the Basic program working space in user memory. Since the hexadecimal form of 17020 consists of four characters, 427C, the two most significant characters, 42, must be converted to decimal form to give the high-order byte of the memory location. The two least-significant characters, 7C, must be converted to decimal form to give the low-order byte.

Memory addr. (hexadecimal)	Instruction (hexadecimal)	Comment
4268	06	Load register B with decimal number 5.
4269	05	
426A	78	Move contents of register B to accumulator.
426B	07	Rotate accumulator left.
426C	C6	Add decimal number 15 to contents of
426D	0F	accumulator, store in accumulator.
426E	21	Load two bytes of memory address in register
426F	7C	pair H-L. Load low-order byte first.
4270	42	
4271	77	Move contents of accumulator to memory address stored in register pair H-L.

Listing 1. This listing is a short program written in Zilog Z-80 machine code. The address of the first instruction is 17000. The program demonstrates the manipulation of data between several registers in the Z-80 microprocessor.

Listing 2. This program is written in ZX80 Basic. It provides routines for converting decimal numbers smaller than 256 to hexadecimal, and hexadecimal to decimal. The routine starting at line 330 converts the five-character decimal memory address used by ZX80 Basic to the two bytes needed when running a program in machine code.

```
10   PRINT "HEX-TO-DECIMAL, DECIMAL-TO-HEX"
20   PRINT "        CONVERSION          "
30   PRINT " "
40   PRINT "ENTER D(BASE 10).. IF CONVERSION IS HEX-TO-DECIMAL, ENTER 0."
```

More

Loyd W. Redman (9707 McKnight Ave. NE, Albuquerque, NM 87112) teaches electronics at Albuquerque Technical-Vocational Institute.

Listing 2 continued.

```
50   PRINT " "
60   INPUT D
70   PRINT "D="; D
80   PRINT " "
90   PRINT "ENTER H$(BASE 16)(2 CHARACTERS).  IF CONVERSION IS DECIMAL-TO-
          HEX, ENTER 0."
100  INPUT H$
110  PRINT " "
120  PRINT "H$="; H$
130  PRINT " "
140  IF D=0 THEN GO TO 170
150  IF D>16000 THEN GO TO 330
160  IF CODE (H$)=28 THEN GO TO 280
170  PRINT H$; "(BASE 16)=";
180  LET A=16
190  LET C=0
200  FOR J=0 TO 2
210  LET B=(CODE(H$)-28*A
220  LET C=C+B
230  LET A=A/16
240  LET H$=TL$(H$)
250  NEXT J
260  PRINT C; "(BASE 10)"
270  STOP
280  PRINT D; "(BASE 10)=";
290  LET F=D/16
300  PRINT CHR$(F+28);
310  PRINT CHR$((D-F*16)+28); "(BASE 16)"
320  STOP
330  LET N=4096
340  LET L=D/N
350  LET E=D-L*N
360  LET F=E/256
370  LET G=E-F*256
380  LET K=L*16+F
390  PRINT "LOW-ORDER BYTE="; G
400  PRINT "HIGH-ORDER BYTE="; K
```

```
10   LET J=USR(17000)
20   POKE 17000, 6
30   POKE 17001, 5
40   POKE 17002, 120
50   POKE 17003, 7
60   POKE 17004, 198
70   POKE 17005, 15
80   POKE 17006, 33
90   POKE 17007, 124
100  POKE 17008, 66
110  POKE 17009, 119
120  LET K=PEEK(17020)
130  PRINT K
```

Listing 3. This is the program of Listing 1 written in ZX80 Basic. The value of K that will be displayed on the screen is 25 (base 10).

The routine beginning at line 330 displays the high-order and low-order bytes in decimal form.

After converting your machine-code instructions to decimal form, enter the program shown in Listing 3. The first time you run it, the result will be 0. Run it a second time and the correct result will be displayed. If the data in either register A or register B is changed, the first run after the change will produce the old result. The second run will display the new result. ■

⌐See List of Advertisers on page 146

Disk Master

You'll always be on top of your disks with this PET catalog and directory program.

By Robert W. Baker

This PET program was designed to easily catalog a number of disks, forming a large master directory on a single diskette. The program automatically reads the directory blocks of any disk placed in drive 1 and writes a condensed directory data file on the master directory disk in drive 0. It also maintains a cross-reference file to record the relationships between disk IDs and disk names. In addition, Disk Master provides several utility functions to locate specific files, display individual directories, list what disk IDs are currently in use and so on.

Disk Master has been constantly evolving over the past year or so, this being the latest edition. It will run on all current PET/CBM systems with Basic 3.0 or 4.0 and with either 40- or 80-column displays. Previously, I had separate versions for the 2040/4040 and 8050 disks. This version combines everything in one program and will work on either. On the 2040/4040 disk, it will even accept DOS 1.0 and DOS 2.1 format disks interchangeably.

Using the Program

To use the program, format a blank disk to become the master directory diskette. If you are using Basic 4.0 then use the Header command. Copy the Disk Master program as the first file on the disk for convenience. Place the diskette in drive 0 and run the program. That's all there is to it. Disk Master will create and maintain all necessary files on the master directory diskette.

This diskette must always be placed in drive 0 for the program to function properly. I would suggest that you do not put any other programs on this disk, since the program assumes that the entire disk is available for storing directories.

Whenever the program is run, a menu is displayed identifying the five major functions available. To perform a specific function, simply enter the indicated number. Entering 0 will terminate the program and return to Basic. The other functions are as follows:

1—Update master directory. When this function is selected, you merely place the diskette to be cataloged in drive 1 and hit any key on the keyboard. The program will display the disk ID and name as read from the disk in drive 1, and wait for verification that the correct disk was actually inserted. If N is entered, the program will wait for another disk to be inserted. After a Y response, the program will continue to read the disk directory and sort the filenames found into alphabetical order.

If the disk ID has already been

Byte	Contents	Definition
0-1	18,1	Track & Sector of first directory block
2	1	DOS 1 format on 2040/3040
	65	ASCII "A" for 4040 format
3	0	null flag
4-143	...	BAM—bit map of available blocks for tracks 1-35 (4 bytes per track) byte-0 = #available sectors in track byte-1 = bit map sectors 0-7 byte-2 = bit map sectors 8-15 byte-3 = bit map sectors 16-23 in bit maps, 1 = available 0 = unavailable (used)
144-161	...	disk name padded with shifted spaces
164	160	shifted space
165-166	160,160	shifted spaces on 2040/3040
	50,65	ASCII "2A" for 4040 DOS version and format type
166-170	160	shifted spaces
171-255	0	nulls, unused

Block availability map for 2040/3040/4040 disk types, header-track 18, sector 0.

Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.

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This intelligent CRT Controller uses an 8085A CPU & an 8275 integrated CRT Controller. It features:

- 25 lines (80 char./line)
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- Does not have graphic capabilities.

Documentation includes program listing and composite video circuit.

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JBE's EPROM Programmer is designed to program 5V 2516's, 2532's & 2716's. It interfaces to the JBE Parallel I/O card using four ribbon cables. An LED indicates when the EPROM is being programmed. A textool zero insertion force socket is used for the EPROM. Comes with complete documentation for writing and reading EPROM's in the Apple II or Apple II Plus. Cables available separately.

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80-244B Bare Board	$24.95

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The JBE 6522 Parallel Interface for the Apple II Computer, plugs directly into any slot 1 through 7 in the Apple. This card has 2 6522 VIA's that provide:

- Four 8 bit bi-directional I/O ports
- Four 16 bit programmable timer/counters
- Serial shift registers
- Handshaking

A 74LS05 is for timing. Four 16 pin sockets provide easy connections to other peripheral devices. (Dip jumpers with ribbon cables are also available from JBE) The 6522 Parallel I/O card interfaces to the JBE EPROM programmer. Understanding of machine language required to use this board. Inputs and outputs are TTL compatible.

79-295A	$69.95 Assembled
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JBEs Speech Synthesizers use the Votrax SC-01 Phoneme Synthesizer chip. The SC-01 phonetically synthesizes continuous speech of unlimited vocabulary. The SC-01 contains 64 different phonemes and 4 levels of inflection accessed by an 8 bit code. It requires 10 Bytes per second for continuous speech. Both boards have an audio amp for direct connection to an 8 ohm speaker.

Documentation includes basic user programs, a phoneme chart and listing of coded words to help you get started. Documentation for the Apple II® Speech Synthesizer includes a disk with many user programs.

81-088 Apple II Speech Synthesizer	$139.95
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Prices include the SC-01 Chip
SC-01 sold separately for $ 75.95

EPROM EXPANSION CARD

JBE EPROM Expander for the Apple II holds six 5V 2716s for a total of 12K bytes of EPROM. This board takes the place of the on board ROM in the Apple. It is software switchable by the same technique used by the Apple II firmware card. Solder jumpers are for reset to the Apple ROM or EPROM Expansion Card. Use JBE EPROM Programmer and Parallel I/O to program your EPROMs. EPROMs sold separately.

81-085A Assm.	$59.95
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81-260 "SLIM"

Single board large scale integration Microcomputer. This 4.5 x 6.5 board uses the 6502 Microprocessor, two 6522 VIA's, four 2114 RAM's, 2516, 2716 or 2532 EPROM. The fully buffered 22/44 pin bus is similar to the KIM® , SYM® , and AIM® expansion connector. The four 8 bit I/O ports connect through 16 pin dip sockets. This board was designed for control and is ideal for Personal and OEM use.

- 6502 MPU
- Two 6522 VIA's
- Four 2114 RAM's (2K bytes)
- One EPROM 2516 or 2532
- Crystal clock 1 Mhz
- Requires 5V 1AMP Power
- 4.5 x 6.5 card
- Power on reset
- Fully buffered-expandable
- Solder mask-both sides

Use your Apple II Computer, JBE 6522 Parallel Interface card and EPROM Programmer as a development system for SLIM.

Prices:

81-260A	$199.95 Assembled
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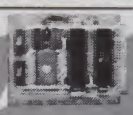
6502 MICROCOMPUTER



6502 MPU, 6522 VIA, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 400 Ma. Two independent 8 bit I/O ports with handshake lines. RC controlled 1 Mhz clock.

Complete documentation. I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

80-153 Assm.	$110.95
80-153 Kit	$ 89.95
80-153 Bare Board	$ 19.95

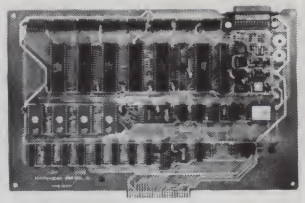
Z-80 MICROCOMUTER

Z-80 MPU, Z-80 PIO, 2716 EPROM, 2114 RAM single board computer. Single 5 volt power supply at 300 Ma. Two independent 8 bit I/O ports with handshake lines. RC controlled 2Mhz clock.

Complete documentation. I/O lines use 50 pin edge connector. Data and address lines are not accessible. Mod. for 2532 is included. EPROM is not included. 1K RAM, 2K EPROM, 2 I/O ports.

80-280 Assm.	$129.95
80-280 Kit	$119.95
80-280 Bare Board	$ 19.95

JBE I MICROCOMPUTER



JBE's 7.75 x 11.75 6502 base Microcomputer has the capacity for 16K of EPROM, 4K of RAM, 8 Parallel Ports and 1 Serial Port. Monitor and Tiny Basic are also available. The fully populated version includes:

- 1 6502 CPU
- 4 6522 VIA (8 Parallel I/O Ports)
- 1 AY5-1013 (Serial I/O Ports)
- 8 2114 RAM (4K)
- 2 2716 EPROM (Monitor & Tiny Basic)

The partially populated version includes:

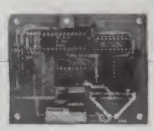
- 1 6502 CPU
- 1 6522 VIA (2 Parallel I/O Ports)
- 1 AY5-1013 (Serial I/O Port)
- 2 2114 RAM (1K)
- 1 2716 EPROM (with Monitor)

Both versions include sockets for 2716s or 2532s, 8 16 pin sockets for I/O interfacing and a DB25 connector for RS232.

All address and data lines are brought off the board to the 50 pin edge connector. (similar to the Apple II bus)

This board also features power on reset and cassette interface.

81-030 C Fully Populated	$349.95
81-030M Partially Populated	$249.95
81-030B Bare Board	$ 89.95
2716 EPROM (with Monitor)	$ 19.95
2715 EPROM (with Tiny Basic	$ 19.95



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cataloged, but with a different disk name, a warning message will be displayed. You can either abort or continue the catalog update function. If everything is OK, the master directory will then be updated and the program will wait for another disk to be inserted. If you enter Q when the program is waiting for a disk to be inserted, the program will terminate the update function and return to the master function menu.

Therefore, you can easily catalog any number of disks by merely inserting them one after another and depressing several keys at the appropriate times. If a disk has already been cataloged, the new directory will simply replace the older entry to update the master directory.

2—Delete disk entry from master. This function allows you to completely remove a particular disk from the master directory. It performs all necessary housekeeping by deleting the appropriate data file and the disk entry in a cross reference list of disk IDs and names. This should be the only method used to remove an entry from the master directory. Do not try to delete the data file manually! The individual directory files are named by "DIR." plus the two-character ID for the corresponding diskette.

The disk to be deleted is identified by its disk ID or name. A cross-reference of disk IDs and names is maintained so either can be specified. To enter the disk name instead of the ID, press return alone for the disk ID and then enter the desired disk name. You can even use an "*" at the end of the disk name to indicate character matching on the characters entered. The program will display a disk name and ID, then check that the correct one is selected. If the response is "N" and an "*" was used for character matching, the next ID entry in the cross-reference list will be displayed. This lets you quickly search for the desired disk if you can't remember the ID or full name. If you enter only an "*" for the disk name, the program will automatically step through the entire list of disks until you indicate the correct one is found. Pressing return alone for the disk name will end the function and return to the master function menu. If a disk ID or name is entered that does not exist in the master directory, an error message will be displayed. Simply depress any key to continue and then enter another disk ID or name.

3—Display selected directory. This function is used to display or print the directory of any particular disk. The specific disk must be identified by its ID or name in the same manner as described in the delete function. Once the correct disk is found, the disk directory displayed or printed will indicate:

- the disk name, ID and format
- the number of blocks free
- each file on the disk, with the number of blocks in the file and the file type
- the total number of files on the disk

While the directory is being displayed or printed, hitting any key will suspend the operation until another key is hit. If the next key hit is Q, the directory will be aborted and you can select another disk to display. Hitting the return key for both the ID and disk name will terminate the function and return to the master function selection menu.

4—Find specified file. This is prob-

Byte	Contents	Definition
0-1	38,0	Track & Sector of 1st BAM block
2	67	ASCII "C" for 8050 format
3-5	0	nulls
6-23	...	disk name padded with shifted spaces
24-25	...	disk id
26	160	shifted space
27-28	50,67	ASCII "2C" for DOS version & format type
29-32	160	shifted spaces
33-255	0	nulls

8050 directory header—track 39, sector 0.

Byte	Contents	Definition
0,1	...	Track & sector of second BAM block or first directory block
2	67	ASCII "C" for 8050 format
3	0	nulls
4	1 or 51	lowest track# in this BAM block
5	51 or 78	highest track# + 1 in this BAM block
6-255	...	BAM for each track (5 bytes per track) first 4 bytes same as in 2040/4040 byte-4 = bit map sectors 24-31

note: 141-255 are unused in 2nd BAM block

8050 BAM format. First BAM block-track 38, sector 0. Second BAM block-track 38, sector 3.

Disk Master program for PET/CBM.

```
10 REM --------- DISK MASTER --------
12 REM
14 REM  2040, 3040, 4040 & 8050 DISKS
16 REM         DOS 1.0 & 2.X
18 REM       BASIC 3.0 AND 4.0
19 REM     40 OR 80 COLUMN DISPLAY
20 REM
30 REM
50 REM
60 REM
70 REM
80 REM
90 REM
99 REM ------------ V2.0 -----------
110 :
120 CLR:C$="":S$=C$:X=0:Y=0:POKE 59468,12
125 CR$=CHR$(13):HC$=CHR$(147):RV$=CHR$(18):RF$=CHR$(146):CL$=CHR$(157)
127 REM CR = CARRIAGE RETURN,  HC = HOME/CLEAR,  RV = REVERSE ON
128 REM RF = REVERSE OFF,      CL = CURSER LEFT
130 GOSUB 2010:DIM D$(230),X$(230)
134 REM ------------------------------
135 REM    READ CROSS REFERENCE TBL
136 REM ------------------------------
138 PRINT"   READING DIRECTORY CROSS REFERENCE"
140 OPEN 15,8,15:PRINT#15,"I0":GOSUB 2080
150 OPEN 5,8,5,"0:DISK DIR XREF,S,R"
160 INPUT#15,EN,EM$,ET,ES:IF EN=62 THEN 280: REM -- NO FILE, NOTHING TO READ
180 INPUT#5,X$(NX):SS=ST:GOSUB 2080:NX=NX+1:IF SS=0 THEN 180
190 GOTO 280
194 REM ----------------------
195 REM    DISK SUBROUTINES
196 REM ----------------------
200 S$="":FOR X=1 TO Y:GOSUB 240:S$=S$+C$:NEXT X:RETURN
210 FOR X=1 TO Y:GOSUB 240:NEXT X:RETURN
220 V=0:GOSUB 240:IF C$<>"" THEN V=ASC(C$)
230 RETURN
240 GET#5,C$
250 SS=ST:INPUT#15,EN,EM$,ET,ES:IF EN=0 THEN RETURN
260 PRINT HC$;RV$;"DISK ERROR!":PRINT:PRINT EN;EM$;ET;ES
270 GOSUB 2020:GOSUB 1980
274 REM ---------------------
275 REM    SELECT FUNCTION
276 REM ---------------------
280 CLOSE 4:CLOSE 5:CX=0:GOSUB 2010
290 PRINT SPC(5);"0 - DONE":PRINT
300 PRINT SPC(5);"1 - UPDATE MASTER DIRECTORY":PRINT
310 PRINT SPC(5);"2 - DELETE DISK ENTRY FROM MASTER":PRINT
320 PRINT SPC(5);"3 - DISPLAY SELECTED DIRECTORY":PRINT
330 PRINT SPC(5);"4 - FIND SPECIFIED FILE":PRINT
340 PRINT SPC(5);"5 - LIST DISK ID'S & NAMES"
350 GOSUB 2020:PRINT"ENTER DESIRED FUNCTION:  ";
360 GOSUB 1990:IF C$="0" THEN PRINT HC$:GOTO 2240
370 V=VAL(C$):IF V<1 OR V>5 THEN 360
380 ON V GOTO 390,1120,940,1590,1180
384 REM ------------------------------
385 REM    UPDATE MASTER DIRECTORY
386 REM ------------------------------
390 CX=0:PRINT HC$;"INSERT UPDATE DISK IN DRIVE #1"
400 PRINT:PRINT"DEPRESS ANY KEY TO CONTINUE, ";RV$;"Q";RF$;" TO QUIT"
410 GOSUB 1990:IF C$="Q" THEN 280
420 GOSUB 2020:PRINT"OK":PRINT#15,"I1":GOSUB 250
430 OPEN 5,8,5,"$1,S,R":GOSUB 250:REM -- OPEN DIRECTORY AS SEQ READ FILE
435 REM -- VF = VERSION FLAG, 67 = 8050
440 GOSUB 220:VF=V:GOSUB 240:IF VF=67 THEN Y=2:GOSUB 210: GOTO 470
445 REM -- SKIP LINES 440,450 IF 8050
450 NB=0:FOR Z=1 TO 35:GOSUB 220:IF Z<>18 THEN NB=NB+V
460 Y=3:GOSUB 210:NEXT Z: REM -- NB = #BLOCKS FREE
470 Y=16:GOSUB 200:DN$=S$:Y=2:GOSUB 210: REM -- DN$ = DISK NAME
475 Y=2:GOSUB 200:DI$=LEFT$(S$+"  ",2): REM -- DI$ = DISK ID
480 GOSUB 2030:IF C$="N" THEN 930
490 IF NX=0 THEN 610
495 REM --- CHECK FOR ANOTHER ENTRY
496 REM --- SAME ID, SAME/DIFF NAME
500 FOR X=0 TO NX-1:C$=LEFT$(X$(X),2):IF DI$<C$ THEN 610
510 IF DI$<>C$ THEN NEXT X:GOTO 610
520 IF DN$=MID$(X$(X),3) THEN 610: REM -- SAME NAME IS OK
530 PRINT HC$;RV$;"*** WARNING ***";RF$;"  THIS DISK ID: ";RV$;DI$;RF$
540 PRINT:PRINT"DISK NAME: ";RV$;DN$
550 PRINT:PRINT"IS ALL READY CATALOGED WITH A DIFFERENT"
560 PRINT:PRINT"DISK NAME: ";RV$;MID$(X$(X),3):GOSUB 2020
570 PRINT"CATALOGING THIS DISK WILL DELETE THE"
580 PRINT:PRINT"PREVIOUS DATA!":GOSUB 2020
590 PRINT"CATALOG THIS DISK";:GOSUB 2050:IF C$="N" THEN 930
600 PRINT HC$;"CATALOGING DISK WITH NEW DISK NAME"
605 REM -- READ DIRECTORY ENTRIES
610 GOSUB 2020:PRINT"READING DIRECTORY ENTRIES ..."
620 GOSUB 240:Y=2:GOSUB 200:DF$=S$:Y=89:IF VF=67 THEN Y=227
625 IF VF=1 THEN DF$=" 1": REM -- DF$ = DISK FORMAT
630 GOSUB 210: IF VF<>67 THEN 639: REM SKIP 632-638 IF NOT 8050
632 NB=0:FOR Z=1 TO 77:IF (Z=1) OR (Z=51) THEN Y=4: GOSUB 210
634 GOSUB 220: IF Z<>39 THEN NB=NB+V
636 Y=4: GOSUB 210: NEXT Z
638 Y=115: GOSUB 210
639 NF=0:Z=0
640 GOSUB 220:FT=V: REM -- FT = FILE TYPE
645 F$=C$:Y=2:GOSUB 210:Y=16:GOSUB 200:Y=9:GOSUB 210
650 GOSUB 220:S$=S$+CHR$(V):GOSUB 220:IF FT=0 THEN 720: REM IF FT=0, DELETED!
660 IF NF=0 THEN 690
670 FOR X=1 TO NF:IF LEFT$(S$,16) < MID$(D$(X),2,16) THEN 700
680 NEXT X
690 X=NF+1:GOTO 710
700 FOR Y=NF TO X STEP-1:D$(Y+1)=D$(Y):NEXT Y
710 D$(X)=F$+S$+CHR$(V):NF=NF+1: REM -- SAVE FILE INFO
720 Z=Z+1:Z=Z-(INT(Z/8)*8):IF Z>0 THEN Y=2:GOSUB 210
```

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Listing continued.

```
725 XX=155:IF VF=67 THEN XX=277
730 IF NF<XX THEN 790: REM -- CHK FOR DESTROYED BAM BLOCK LINKING
740 PRINT HC$;SPC(6);RV$;"*** DISK BAM IS INVALID ***";RF$:GOSUB 2020
750 PRINT:PRINT"   CURRENT DISK CANNOT BE CATALOGED!":PRINT:PRINT:PRINT
760 PRINT" PLEASE VERIFY OR CHECK DISK CONTENTS":PRINT
770 PRINT"BEFORE ATTEMPTING TO CATALOG THIS DISK.":PRINT
780 GOSUB 2020:GOSUB 1980:GOTO 930
790 IF SS=0 THEN 640
800 CLOSE 5:GOSUB 2020:PRINT"UPDATING MASTER DIRECTORY ..."
810 IF NX=0 THEN 860
820 FOR X=0 TO NX-1:C$=LEFT$(X$(X),2):IF DI$ < C$ THEN 850
830 IF DI$=C$ THEN 880
840 NEXT X:GOTO 860
850 FOR Y=NX-1 TO X STEP-1:X$(Y+1)=X$(Y):NEXT Y:GOTO 870
860 X=NX
870 NX=NX+1
880 X$(X)=DI$+DN$:CX=1
890 GOSUB 1910:PRINT#15,"S"+S$:OPEN 5,8,5,S$+",S,W":GOSUB 250
900 PRINT#5,DF$;",";NB;CR$;:GOSUB 250
910 IF NF>0 THEN FOR X=1 TO NF:PRINT#5,D$(X);CR$;:GOSUB 250:NEXT X
930 CLOSE 5:GOSUB 2150:GOTO 390
934 REM ---------------------------
935 REM    DISPLAY SELECTED DIRECTORY
936 REM ---------------------------
940 PRINT"]TO DISPLAY DISK DIRECTORY":GOSUB 1770:ON V GOTO 280,940
950 OPEN 5,8,5,S$+",S,R":GOSUB 250:GOSUB 1940:INPUT#5,DF$,NB:GOSUB 250
960 PRINT#4,"  ";RV$;"DISK NAME:";RF$;"  ";DN$:PRINT#4
970 PRINT#4,SPC(4);RV$;"DISK ID:";RF$;"  ";DI$;SPC(6)
975 PRINT#4,RV$;"DISK FORMAT:";RF$;"  "DF$:PRINT#4
980 PRINT#4,RV$;"BLOCKS FREE:";RF$;" ";NB:PRINT#4
990 PRINT#4,"───────────────────────────────────────":PRINT#4: REM <- 39 CHRS
1000 NF=0:IF SS>0 THEN 1100
1010 GOSUB 220:FT=V:Y=16:GOSUB 200:GOSUB 220:Z=V:GOSUB 220:GOSUB 240
1020 PRINT#4,RIGHT$("    "+STR$(Z+(256*V)),4);"  ";S$;"   ";
1025 REM          ↑ 4 SPACES       2 SPACES ↑        ↑ 3 SPACES
1030 IF FT=129 THEN PRINT#4,"SEQ";: REM -- DECODE FILE TYPE
1040 IF FT=130 THEN PRINT#4,"PGM";
1050 IF FT=131 THEN PRINT#4,"USR";
1055 IF FT=132 THEN PRINT#4,"REL";
1060 PRINT#4:GET C$:IF C$<>"" THEN GOSUB 1990
1070 IF C$="Q" THEN 1110
1080 NF=NF+1:IF SS=0 THEN 1010
1090 PRINT#4:PRINT#4,RV$;"#FILES:";RF$;" ";NF
1100 IF PD=3 THEN GOSUB 2020:GOSUB 1980
1110 CLOSE 4:CLOSE 5:GOTO 940
1114 REM ----------------------
1115 REM    DELETE DISK ENTRY
1116 REM ----------------------
1120 PRINT HC$;"TO DELETE DISK FROM MASTER DIRECTORY"
1125 GOSUB 1770:ON V GOTO 1170,1120
1130 PRINT#15,"S"+S$
1140 CX=0:FOR X=0 TO NX-1:IF LEFT$(X$(X),2)=DI$ THEN CX=1
1150 IF CX THEN X$(X)=X$(X+1)
1160 NEXT X:NX=NX-1:GOTO 1120
1170 GOSUB 2150:GOTO 280
1174 REM ---------------------
1175 REM LIST DISK ID'S & NAMES
1176 REM  AS DESIRED.....
1177 REM ---------------------
1180 IF NX=0 THEN GOSUB 1780:GOTO 280
1190 CLOSE 4:GOSUB 2010
1200 PRINT SPC(5);"0 - RETURN TO MAIN FUNCTION MENU":PRINT
1210 PRINT SPC(5);"1 - PRINT FULL ID USEAGE CHART":PRINT
1220 PRINT SPC(5);"2 - QUICK LIST OF ID'S IN USE":PRINT
1230 PRINT SPC(5);"3 - LIST DISK ID'S & NAMES":PRINT
1235 PRINT SPC(5);"4 - LIST ";RV$;"MIN";RF$;" FREE BLOCKS PER DISK":PRINT
1238 PRINT SPC(5);"5 - LIST ";RV$;"MAX";RF$;" FREE BLOCKS PER DISK"
1240 GOSUB 2020:PRINT"ENTER DESIRED FUNCTION:  ";
1250 GOSUB 1990:IF C$="0" THEN 280
1260 V=VAL(C$):IF V<1 OR V>5 THEN 1250
1270 PRINT C$:ON V GOTO 1280,1460,1520,2500,2600
1275 REM --- ID USEAGE CHART
1280 OPEN 4,4:OPEN 6,4,6
1290 PRINT#4,SPC(15);RV$;"  D I S K   I D   U S E A G E   C H A R T  ":PRINT#4
1300 PRINT#4," ";
1310 FOR X=48 TO 90:IF X=58 THEN X=65
1320 PRINT#4," ";CHR$(X);:NEXT X:PRINT#4:PRINT#6,CHR$(18)
1330 Z=0:FOR X=48 TO 90:IF X=58 THEN X=65
1333 REM -- FOLLOWING LINES USE ALTERNATING
1334 REM -- SHIFTED LEFT-BRACKET ([)
1335 REM -- & SHIFTED AT-SIGN (@)                 (36 EACH TOTAL)
1340 PRINT#4," ┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼";
1350 PRINT#4,"─┼─┼─┼─┼─┼─┤":REM <-- LAST CHAR IS SHIFTED 3
1360 PRINT#4,CHR$(X);
1370 FOR Y=48 TO 90:IF Y=58 THEN Y=65
1380 PRINT#4,CHR$(221);:IF Z=NX THEN 1410
1390 C$=CHR$(X)+CHR$(Y):S$=LEFT$(X$(Z),2)
1400 IF S$=C$ THEN PRINT#4,CHR$(166);:Z=Z+1:GOTO 1420
1410 PRINT#4," ";
1420 NEXT Y:PRINT#4,CHR$(221):GET C$:IF C$<>"" THEN GOSUB 1990
1430 IF C$<>"Q" THEN NEXT X
1435 REM -- FOLLOWING LINES USE ALTERNATING
1436 REM -- SHIFTED 1 AND
1437 REM -- SHIFTED AT-SIGN (@)                (36 EACH TOTAL)
1440 PRINT#4," ┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴";
1450 PRINT#4,"─┴─┴─┴─┴─┴─┴─┘":PRINT#6,CHR$(24):GOTO 1190:REM <-LAST CHAR SHIFT =
1455 REM --- QUICK LIST OF ID'S
1460 GOSUB 1940:PRINT#4,SPC(7);RV$;"DISK ID'S CURRENTLY IN USE"
1465 PRINT#4:PRINT#4
1470 V=12:IF PD=4 THEN V=25
1480 Z=0:FOR X=0 TO NX-1:PRINT#4,LEFT$(X$(X),2);" ";
1490 Z=Z+1:IF Z=INT(Z/V)*V THEN PRINT#4
1500 NEXT X:PRINT#4:PRINT#4:IF Z<>INT(Z/V)*V THEN PRINT#4
1510 PRINT#4,Z;RV$;"DISKS IN MASTER DIRECTORY":GOTO 1570
1515 REM --- LIST ID'S & NAMES (FULL LIST)
```

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Byte	Contents
0-1	track & sector of next directory block track=0 in last directory block
2-31	file entry 1
34-63	file entry 2
66-95	file entry 3
98-127	file entry 4
130-159	file entry 5
162-191	file entry 6
194-223	file entry 7
226-255	file entry 8

Common directory format. First directory block on 2040/4040-track 18, sector 1. First directory block on 8050-track 39, sector 1.

Byte	Contents
0	File type flag: 128 = file deleted 129 = Sequential file 130 = Program 131 = User file 132 = Relative file
1-2	track & sector of first block in file
3-18	file name padded with shifted spaces
19-20	track & sector of first side sector block for relative files only
21	record size for relative files
22-25	unused
26-27	track & sector of replacement file when OPEN@ is in effect
28-29	number of blocks in file (low byte, high byte)

Structure of single directory entries.

ably the most handy feature of Disk Master. It provides a method of finding all copies of a particular file and what disks they can be found on. Again, character matching can be used when entering the filename by adding a trailing "*", but at least one character must precede the "*". If an "*" is not used, then the filename must match exactly to be displayed or printed. Otherwise, if the specified number of characters match, the file will be included in the list. Thus, you can quickly list all files that start with the word disk, for example, by entering a filename of DISK*. Entering return alone for the filename will return the program to the master menu.

While the list of files is being displayed or printed, hitting any key will suspend the operation until another key is depressed. If the next key hit is Q, the function will be terminated and you can enter another file to search for.

5—List disk IDs and names. This function provides various lists of the disk IDs and names for the disks currently cataloged. It displays another menu to select the desired list. While any list is being displayed or printed, hitting any key will suspend the operation until another key is depressed. If the next key entered is Q, the operation will be aborted and control will return to the list selection menu. Entering zero for the list selection will return to the master function menu. The other lists provided are as follows:

Typing 1 prints a chart showing all IDs currently in use. This is about a two-page list (one page on a 2022 printer, two pages on a 2023 printer) and must be printed on the printer. It shows all IDs consisting of the numbers 0 to 9 and the letters A to Z in any combination. It is intended to be used as a check sheet when assigning new IDs. This chart uses the PET graphics, so will probably not print correctly with non-Commodore printers.

Typing 2 displays or prints a quick list of all IDs currently in use in alphabetical order. Only the IDs are given along with an indication of the total number of IDs cataloged.

Typing 3 displays or prints a list of all IDs in use along with the corresponding disk names. This list is printed in alphabetical order, as per the disk IDs.

Typing 4 displays or prints a list of all cataloged diskettes, showing the number of free blocks on each disk along with the disk ID and name. The program allows you to specify a minimum number of free blocks for a particular disk to be included in the list. This lets you, for instance, indicate that you want a list of all disks with at least 100 free blocks. The default value is zero, so every diskette currently cataloged will be listed.

Typing 5 is similar to function 4 above except that it lets you specify a maximum number of free blocks for a particular disk to be included in the list. This allows you, for instance, to indicate that you want a list of all disks with no more than ten free blocks. An arbitrary default value has been preset at 99. When entering a single digit number, be sure to clear the last 9 of the default 99 value.

The Program

The key to Disk Master's operation is the ability to read any disk's directory blocks as a sequential data file. This fact is not documented in the Commodore manuals but it can be easily done as shown in line 430 of the program. Simply open a file by the name of $0 or $1, depending on the desired drive number. This eliminates most compatibility problems since the system will always handle the directory blocks the same way regardless of the PET/CBM or disk operating system ROMs. By using the disk command channel, channel 15, for all disk commands, the program will be totally compatible with all current systems.

Once the directory is opened as a file, the first character read identifies the type of disk and the disk format:

Value Read	Disk Type
1	2040
65	4040
67	8050

```
DISK NAME: PRODUCTS #2
  DISK ID: 31        DISK FORMAT: 2A
BLOCKS FREE: 555

 13  DISASM                 PGM
 36  DISK MASTER.DOC        PGM
 28  DISK MASTER            PGM
 12  SYM LIST+              PGM
 12  UNCOMPACTOR.DOC        PGM
  8  UNCOMPACTOR            PGM

FILES: 6
```

Sample disk directory from Disk Master.

Listing continued.

```
1520 GOSUB 1940:PRINT#4,RV$;"ID  ...DISK NAME....":PRINT#4
1530 FOR X=0 TO NX-1:PRINT#4,LEFT$(X$(X),2);"  ";MID$(X$(X),3)
1540 GET C$:IF C$<>"" THEN GOSUB 1990
1550 IF C$="Q" THEN 1190
1560 NEXT X
1570 IF PD=4 THEN 1190
1580 GOSUB 2020:GOSUB 1980:GOTO 1190
1585 REM --- FIND SPECIFIED FILE/DISK
1590 IF NX=0 THEN GOSUB 1780:GOTO 280
1600 CLOSE 4:PRINT HC$;"TO FIND WHAT DISK(S) A FILE IS ON":PRINT
1610 PRINT"ENTER FILE NAME   .";CL$;CL$;CL$;:INPUT F$: IF F$="." THEN 280
1620 IF F$="*" THEN PRINT:PRINT"RE-";:GOTO 1610
1630 S$=F$:GOSUB 1920:V=Y:GOSUB 1940
1640 PRINT#4,RV$;"...FILE NAME....  ID  ...DISK NAME....":PRINT#4
1650 PRINT#4,S$:PRINT#4
1660 FOR Z=0 TO NX-1:DI$=LEFT$(X$(Z),2):DN$=MID$(X$(Z),3)
1670 GOSUB 1910:OPEN 5,8,5,S$+",S,R":GOSUB 250:INPUT#5,DF$,NB:GOSUB 250
1680 GOSUB 240:Y=16:GOSUB 200:Y=3:GOSUB 210
1690 IF F$ < LEFT$(S$,Y) THEN 1740
1700 IF F$ = LEFT$(S$,Y) THEN PRINT#4,S$;"  ";DI$;"  ";DN$: REM <- 2 SPACES EA
1710 GET C$:IF C$<>"" THEN GOSUB 1990
1720 IF C$="Q" THEN CLOSE 5:GOTO 1600
1730 IF SS=0 THEN 1680
1740 CLOSE 5:NEXT Z
1750 IF PD=3 THEN GOSUB 2020:GOSUB 1980
1760 GOTO 1600
1764 REM ----------------------
1765 REM     MISC SUBROUTINES
1766 REM ----------------------
1770 V=3:IF NX>0 THEN 1790
1780 PRINT HC$;RV$;"NO ENTRIES";:V=1:GOTO 1890
1790 PRINT:PRINT "ENTER DISK ID   .";CL$;CL$;CL$;:INPUT DI$
1795 DI$=LEFT$(DI$+"  ",2):IF DI$=". " THEN 1840
1800 FOR X=0 TO NX-1:IF DI$<>LEFT$(X$(X),2) THEN NEXT X:GOTO 1880
1810 DN$=MID$(X$(X),3):DI$=LEFT$(X$(X),2)
1820 GOSUB 2030:IF C$="N" THEN V=2:RETURN
1830 GOTO 1910
1840 PRINT:PRINT"ENTER DISK NAME   .";CL$;CL$;CL$;:INPUT F$
1845 IF F$="." THEN V=1: RETURN
1850 GOSUB 1920:FOR X=0 TO NX-1:IF Y=0 THEN 1900
1860 IF F$=MID$(X$(X),3,Y) THEN 1900
1870 NEXT X
1880 PRINT:PRINT RV$;"NOT";:V=2
1890 PRINT" IN MASTER DIRECTORY!":GOSUB 2020:GOTO 1980
1900 DN$=MID$(X$(X),3):DI$=LEFT$(X$(X),2):GOSUB 2030:IF C$="N" THEN 1870
1910 S$="0:DIR."+DI$:RETURN
1920 F$=LEFT$(F$,16)
1925 IF RIGHT$(F$,1)="*" THEN Y=LEN(F$)-1:F$=LEFT$(F$,Y):RETURN
1930 Y=16:F$=LEFT$(F$+"                ",16):RETURN: REM <-- 16 SPACES
1940 GOSUB 2020:PRINT"WANT PRINTED COPY";:GOSUB 2050:GOSUB 2020
1950 PD=3:IF C$="Y" THEN PD=4
1960 OPEN 4,PD:IF PD=3 THEN PRINT HC$;
1970 RETURN
1980 PRINT"DEPRESS ANY KEY TO CONTINUE"
1990 GET C$:IF C$="" THEN 1990
2000 RETURN
2010 PRINT HC$;SPC(9);RV$;"D I S K   M A S T E R"
2020 PRINT:PRINT"-----------------------------------":RETURN: REM <- 40
2030 PRINT HC$;RV$;"DISK NAME:";RF$;"  ";DN$:PRINT
2035 PRINT "  ";RV$;"DISK ID:";RF$;"  ";DI$:GOSUB 2020
2040 PRINT"CORRECT DISK";
2050 PRINT" (Y/N) ?  ";
2060 GOSUB 1990:IF C$<>"Y" AND C$<>"N" THEN 2060
2070 PRINT C$:RETURN
2080 INPUT#15,EN,EM$,ET,ES:IF EN=0 THEN RETURN
2090 PRINT HC$;RV$;"DISK ERROR";RF$;" WHILE ";
2100 IF CX THEN PRINT"WRITING NEW"
2110 IF CX=0 THEN PRINT"READING"
2120 PRINT:PRINT"DISK DIRECTORY CROSS REFERENCE FILE.":PRINT
2130 PRINT EN;EM$;ET;ES
2140 PRINT:PRINT RV$;"PROGRAM ABORTED!":GOTO 2240
2150 IF CX=0 THEN RETURN
2160 GOSUB 2020:PRINT"UPDATING DIRECTORY CROSS REFERENCE ...":PRINT
2170 IF NX=0 THEN PRINT#15,"S0:DISK DIR XREF":RETURN
2180 PRINT#15,"S0:DIR XREF.TEMP"
2190 OPEN 5,8,5,"0:DIR XREF.TEMP,S,W":GOSUB 2080
2200 FOR X=0 TO NX-1:PRINT#5,X$(X);CR$;:GOSUB 2080:NEXT X
2210 CLOSE 5:PRINT#15,"S0:DISK DIR XREF"
2220 PRINT#15,"R0:DISK DIR XREF=0:DIR XREF.TEMP":GOSUB 2080
2230 RETURN
2240 CLOSE 4:CLOSE 5:CLOSE 15:END
2250 REM --------------------------
2260 REM LIST DISKS BY #BLOCKS FREE
2270 REM --------------------------
2500 PRINT HC$;"ENTER MINIMUM NUMBER OF FREE BLOCKS"
2510 PRINT:PRINT"TO BE DISPLAYED   0";CL$;CL$;CL$;:INPUT S$: REM - DEFAULT=0
2520 Y=VAL(S$):IF S$<>"0" AND Y=0 THEN 1190
2530 VF=0:GOTO 3000
2600 PRINT HC$;"ENTER MAXIMUM NUMBER OF FREE BLOCKS"
2610 PRINT:PRINT"TO BE DISPLAYED   99";CL$;CL$;CL$;CL$;:INPUT S$
2620 Y=VAL(S$):IF Y=0 THEN 1190
2630 VF=1
3000 GOSUB 1940:PRINT#4,RV$;"#BLKS FREE  ID  ...DISK NAME....":PRINT#4
3010 FOR X=0 TO NX-1:DI$=LEFT$(X$(X),2):DN$=MID$(X$(X),3)
3020 OPEN 5,8,5,"0:DIR."+DI$+",S,R":GOSUB 250:INPUT#5,DF$,NB:GOSUB 250:CLOSE 5
3030 IF (VF=0) AND (NB<Y) THEN 3050
3035 IF (VF=1) AND (NB>Y) THEN 3050
3040 PRINT#4,RIGHT$("      "+STR$(NB),7);SPC(5);DI$;"  ";DN$
3045 REM              ↑ 7 SPACES                    ↑ 2 SPACES
3050 GET C$:IF C$<>"" THEN GOSUB 1990
3060 IF C$="Q" THEN 1190
3070 NEXT X:GOTO 1570
READY.
```


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After knowing the disk format, the remaining data can be read and decoded properly to find the DOS version and format type, the disk name and ID and the specific file information.

Chapter 5 of the latest Commodore User Manual for the disk drives includes several tables that give the exact layout of the directory header, the block availability map (BAM) and the actual directory blocks for the current disk types. I've condensed some of the information here so you can see what Disk Master is reading. Just remember that the program does not see the first two bytes of each disk block when reading the directory as a sequential data file. The disk controller will automatically handle the linking from block to block for the program, so there's no need to worry about tracks and sectors.

As you can see in the tables, there's very little difference between the 2040 and 4040 directory blocks. The only real difference is the addition of the DOS version and format in bytes 165 and 166 of track 18, sector 0 on a 4040 disk. On the older 2040 disk these bytes were shifted spaces.

When you go to an 8050 disk, however, there's been a major reorganization of the directory header information. With the increased disk capacity of 77 tracks, the BAM no longer fits in the same block as the directory header. One block (track 39, sector 0) is reserved as the directory header and two blocks are now reserved for the BAM (track 38, sectors 0 and 3). All three of these directory blocks on the 8050 disk contain the 8050 format character as the first byte following the two-byte link to the next directory block.

Disk Master, therefore, recognizes these different formats and reacts accordingly while reading the header

```
[illegible]

DISK*

DISK DISPLAY        30  PRODUCTS #1
DISK LISTER         30  PRODUCTS #1
DISK MASTER.DOC     31  PRODUCTS #2
DISK MASTER         31  PRODUCTS #2
DISK COMM2          84  MISC #4
DISK COMM3          84  MISC #4
DISK COMM           84  MISC #4
DISK DIR            84  MISC #4
DISK DISPLAY        84  MISC #4
DISK OVERLAYS       84  MISC #4
DISK READ           84  MISC #4
DISK WRITE          84  MISC #4
DISK MASTER.DOC     DM  DISK MASTER HIS
DISK MASTER/1.6     DM  DISK MASTER HIS
DISK MASTER/1.7     DM  DISK MASTER HIS
DISK-TAPE COPY      DT  DASM/TASM PKG
DISK.TO.CASS        T2  ASM/TED USERS-U2
DISK.LISTER         T3  USER GROUP - U3
DISK COPY           U1  UTILITY PRGMS #1
DISK DISPLAY        U1  UTILITY PRGMS #1
DISK-TAPE COPY      U1  UTILITY PRGMS #1
DISKANAL            U2  UTILITY PGMS #2
DISKINDX            U2  UTILITY PGMS #2
DISK COMM2          V2  TEST/DEMO
DISK COMM3          V2  TEST/DEMO
DISK COMM           V2  TEST/DEMO
DISK DIR            V2  TEST/DEMO
DISK DISPLAY        V2  TEST/DEMO
DISK OVERLAYS       V2  TEST/DEMO
DISK READ           V2  TEST/DEMO
DISK WRITE          V2  TEST/DEMO
DISK DIR XREF       WK  WORK DISK
DISK MASTER         WK  WORK DISK
```

Sample output when asked to search for all files starting with the word disk.

```
[illegible]

00 18 20 30 31 51 52 53 54 55 56 81 82 83 84 85 A1 A2 C1 C2 CP DM DT G1 GL
MA PP RC SE SS T1 T2 T3 TF U1 U2 V2 VC WK WT

 40 [illegible]
```

Sample quick list of disk IDs in use.

```
[illegible]

00  GENERAL
18  EDITOR(16K)
20  OLD ROM/8K #1
30  PRODUCTS #1
31  PRODUCTS #2
51  GAMES #1
52  GAMES #2
53  GAMES #3
54  GAMES #4
55  GAMES #5
56  GAMES #6
81  MISC #1
82  MISC #2
83  MISC #3
84  MISC #4
85  MISC #5
A1  ASSEMBLER #1
A2  MAE (8032)
C1  CONCAL #1
C2  CONCAL #2
CP  CONSULTING PROJS
DM  DISK MASTER HIS
DT  DASM/TASM PKG
G1  GALAXY ONE
GL  GENERAL LEDGER
MA  MAG ARTICLES
PP  PETPOURRI COLUMN
RC  REVIEW COPY
SE  SCREEN EDIT 4.1
SS  SUPERSORT
T1  ASM/TED USERS-U1
T2  ASM/TED USERS-U2
T3  USER GROUP - U3
TF  TRANSACTION FILE
U1  UTILITY PRGMS #1
U2  UTILITY PGMS #2
V2  TEST/DEMO
VC  VISICALC
WK  WORK DISK
WT  WP TRAINER
```

Sample list of disks cataloged by Disk Master.

↙See List of Advertisers on page 146

blocks. Once past the header and BAM information, the actual directory entries for each file are stored exactly the same on all current disk types. They are, however, quite wasteful of space.

```
BLKS FREE  DOS  NAME
 374   00  GENERAL
 434   18  EDITOR(16K)
 166   20  OLD ROM/8K #1
 555   31  PRODUCTS #2
 148   55  GAMES #5
 326   56  GAMES #6
 343   A1  ASSEMBLER #1
 276   A2  MAE (8032)
 434   C1  CONCAL #1
 254   C2  CONCAL #2
 402   CP  CONSULTING PROJS
 565   DM  DISK MASTER HIS
 386   DT  DASM/TASM PKG
 124   G1  GALAXY ONE
 232   GL  GENERAL LEDGER
 218   MA  MAG ARTICLES
 340   PP  PETPOURRI COLUMN
 529   RC  REVIEW COPY
 307   SE  SCREEN EDIT 4.1
 210   SS  SUPERSORT
 659   TF  TRANSACTION FILE
 108   U2  UTILITY PGMS #2
 484   V2  TEST/DEMO
 485   VC  VISICALC
 620   WK  WORK DISK
 599   WT  WP TRAINER
```

Sample output when asked to list all disks with at least 100 free blocks left.

Looking back at the program listing, lines 390 through 790 are used to read the directory information in the proper format and check for previous entries in the master directory. Lines 800–930 then sort the directory entries and write a condensed directory on the master directory disk in drive 0. This condensed directory contains the disk format and total number of free blocks followed by the individual directory entries. Each entry consists of a one-byte file type, the 16-character file name, and two bytes indicating the number of blocks in the file. Thus, the original 30-byte directory entry is condensed to a 19-byte entry for each file on the disk. Most of the BAM and directory header information is stored in a cross-reference file that correlates the disk ID with the disk name for later reference.

Each of the condensed directories is stored as a separate file on the master directory disk. This limits you to cataloging about 140 entries with a 2040/4040 disk or about 220 entries with an 8050 disk. This should be more than enough for almost anyone.

The rest of the program should be pretty straightforward. I've used several variables to replace cursor controls and added several comments to make it easier to copy the program from the magazine. If you are entering the program from the printed listing, I would strongly recommend that you leave out all comments (REMs). If you'd rather not do all that typing, I'll supply a copy on either a 4040 or 8050 disk for $5 to cover costs. Please remember to specify which disk you are using! ■

```
BLKS FREE  DOS  NAME
   5   30  PRODUCTS #1
   6   51  GAMES #1
  28   52  GAMES #2
  17   53  GAMES #3
   9   54  GAMES #4
   3   81  MISC #1
  15   82  MISC #2
   4   83  MISC #3
  26   84  MISC #4
   1   T1  ASM/TED USERS-U1
   8   T2  ASM/TED USERS-U2
   6   T3  USER GROUP - U3
  19   U1  UTILITY PRGMS #1
```

Sample output when asked to list all disks with no more than 50 free blocks left.

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A Rainbow of Colors For the S-100

It's not impossible to get good, cheap graphics for the S-100. Increase your color graphics potential with the Spectrum graphics board from CompuPro.

By Phil Lapsley

If you'd like to see more on your video screen than characters, CompuPro, a division of Godbout Electronics in Oakland, CA, may have a product for you—the Spectrum high-resolution color graphics board.

The board is fully compatible with the proposed IEEE S-100 bus standard, and provides 8K bytes of quick, low power static random-access memory (RAM) when it is not being used as a graphics board. A number of other goodies have been thrown in, such as a parallel port and a 75k video output connection.

Graphics

All these features are nice, and make for an excellent board, but the best thing about the Spectrum is, naturally, its graphics. You're able to select from nine different graphics modes, ranging from the alpha/semigraphics mode (32 by 64 pixels or picture elements) to the high-resolution graphics mode (256 by 192 pixels).

In the alpha/semigraphics mode, the board's internal character generator produces 64 ASCII characters, which may be displayed in normal or inverse format. This mode also lets you take advantage of the "semigraphics" format. This is where one character's 8 by 12 pixel block is broken up into four 4 by 6 cells. Since there are four cells per character space, the entire block is controlled by one byte. The four least-significant bits control which of the four cells are to be on, the next three control the color of the cells, and the most-significant bit sets the semigraphics mode. Therefore, there are nine possible colors (actually eight, plus black). Photo 1 shows the colors shown in the alpha/semigraphics mode.

The true color graphics modes range from densities of 64 by 64 to 128 by 192 pixels. The last mode is the most enjoyable. In all of the color modes each element of the display may be one of four colors. There are two sets of four colors, so there are actually eight possible colors in these modes, but only four can be displayed at one time (see Photo 2). These modes use varying amounts of memory; the smallest takes only 1K bytes, while the 128 by 192 mode takes 6K.

The graphics modes range from 128 by 64 to 256 by 192 pixels, the

Address correspondence to Phil Lapsley, 953 Carol Lane, Lafayette, CA 94549.

Photo 1. Color bars showing the range of color obtainable in the alpha/semigraphics modes. (Photos by Kevin Fischer.)

Photo 2. A scene from the SubLogic color demonstration program, using the 128 by 192 color graphics mode.

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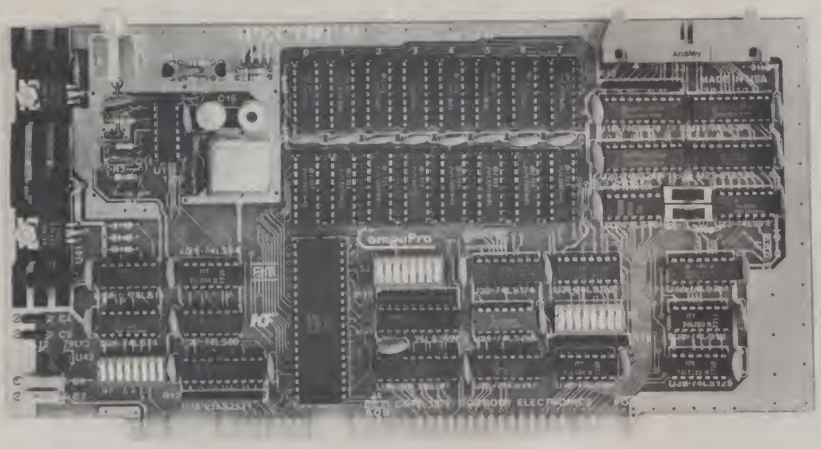

The Spectrum Graphics board from Godbout Electronics, Box 2355, Oakland Airport, CA 94614.

densest mode available. Unlike the color modes, each element of the picture is simply either on or off. However, like the color graphics modes, there are two sets of the "on" color, giving a total of three possible colors (either black and green or black and buff – see Photo 3).

The mode is set through the Spectrum's control port. This is a five-bit (the upper three bits are ignored) port tied to the board. The board is controlled in the following manner: bit 5 puts the board in the graphics mode if high, and in the RAM mode if low; bit 4 controls the two color groups; bit 3 puts the board in the graphics modes or in the alpha/semigraphics mode; bits 2 through 0 set one of the eight possible graphics modes.

The board's addressing is by bit mapping. This means that bits of memory control the display. A main advantage of this is that it allows a large number of pixels (49,152 in the 256 by 192 mode) to be stored in a small area (6144 eight-bit bytes). A disadvantage of this is that calculating memory addresses that correspond to given X-Y coordinates takes some time. But this isn't a serious problem, as I'll show in the following paragraphs.

Software

Although Godbout has written no software packages for the Spectrum, Godbout sells a package written by Bruce Artwick of SubLogic company. This program, the Universal Graphics Interpreter (UGI), is an excellent piece of software. The program takes a display file, which is a list of commands, interprets it and draws on the screen. The program is referred to as "universal" because it allows a display file that will run on the Spectrum to run on, for example, the Cromemco Dazzler.

Earlier I stated that speed is not a serious problem. This is because of the UGI's "stack-blasting" driver. This driver makes possible speeds of up to 500 lines per second (at 4 MHz) with no "snow" present on the screen. The number of commands supported by the UGI boggles the mind (mine, at least). Among the many commands are plot point, draw line, erase, absolute cursor position, draw rectangle (shaded or nonshaded), draw circle (shaded or nonshaded – see Photo 4), draw shaded polygon, display character (large, small or sideways), and a chain command akin to Apple's shape table commands.

Another program, not offered by

Photo 3. A picture of one of my demo programs in the 256 by 192 two-color graphics mode.

Reader Service for facing page ↙154→

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Photo 4. An example of the Universal Graphics Interpreter's shaded circle command, in the 128 by 192 color graphics mode.

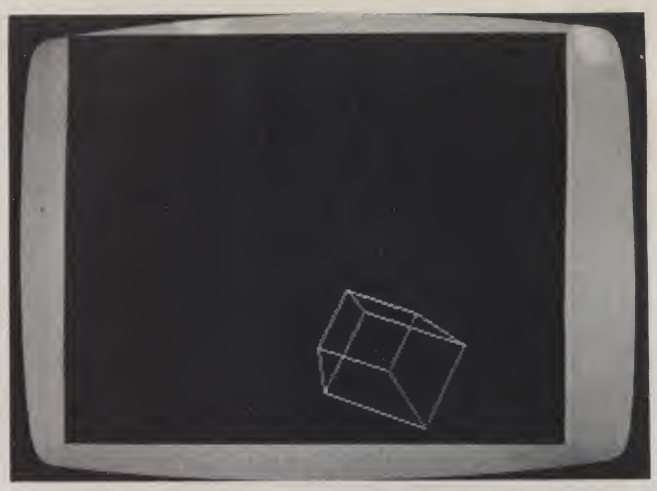


Photo 5. A cube, as viewed by the SubLogic 3D to 2D converter, in the 256 by 192 graphics mode.

Godbout but by SubLogic, is a 3D interpreter package. This program allows you to set up a scene in 3D coordinates, and translates these into 2D lines and points understandable by the UGI. Once the scene is set up, it can be viewed from any angle and any X-Y-Z position (some examples are in Photos 5, 6 and 7). All these features make up a very interesting (to say the least) program.

Hardware

The Spectrum board is a standard S-100 card. It is double-sided and solder-masked. I've found that the video output jack is a little large to fit in my Imsai's case, but this can be corrected by using a plug bent 90 degrees. The memory of the board is addressable by DIP switch to any 8K boundary and can be disabled by a switch setting. The memory of the Spectrum needs no wait-states in a 2 MHz system, but it requires one in a 4 or 5 MHz system. This problem occurs only in the graphics mode, to ensure reliable data transfer.

The Spectrum also contains provisions for extended 24-bit addressing. The one problem with this is that some traces must be cut to eliminate them for systems that don't use extended addressing. Above and beyond all this finery, the Spectrum also has a parallel input/output port. This can be used for joysticks, a keyboard or just about anything else needing a parallel port. The edge connector for the input/output port is a 26-pin I/O connector. A problem I have found with this is that 26-pin connectors are rather scarce in my area.

At the heart of the Spectrum is Motorola's 6847 video-display generator. This 40-pin chip controls all of the on-board functions except I/O and memory addressing. The memory is made up of 16 5257 4K by 1 bit static RAM chips and is liberally sprinkled with bypass capacitors.

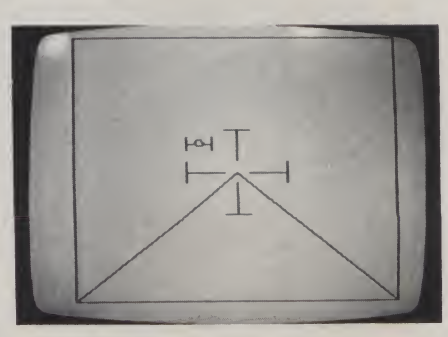


Photo 8. A Star Wars type game, written in North Star Basic and using the UGI in the 256 by 192 graphics mode.

This results in extremely smooth operation. All the ICs are fully socketed using TI low profile sockets.

General Comments

I've now used the Spectrum for about a year, and I'm pleased with it. The graphics are excellent and the software packages offered by SubLogic make it much easier to work

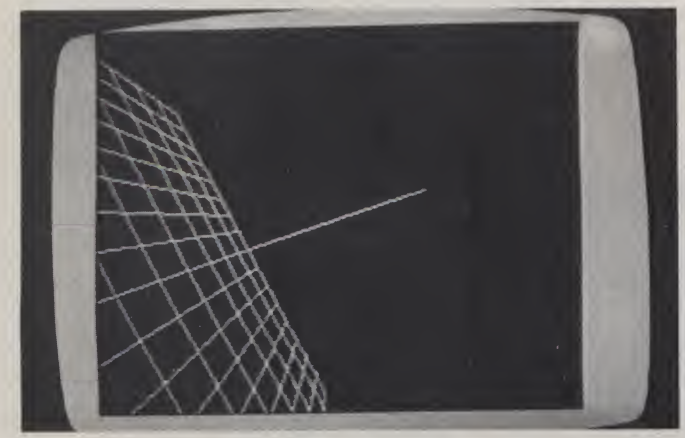


Photo 6. A ground grid, viewed from a height and at a roll of 60 degrees.

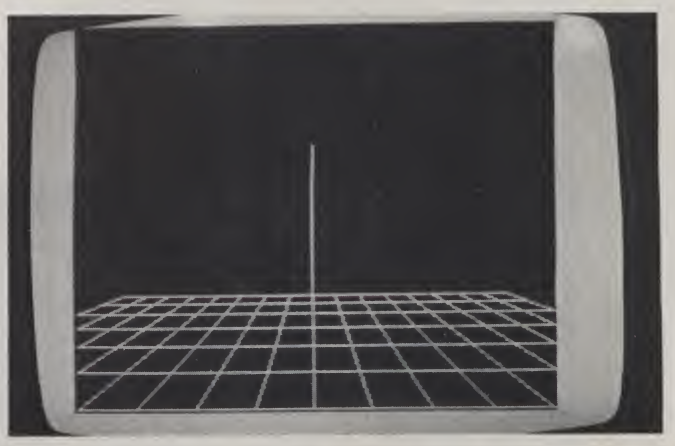
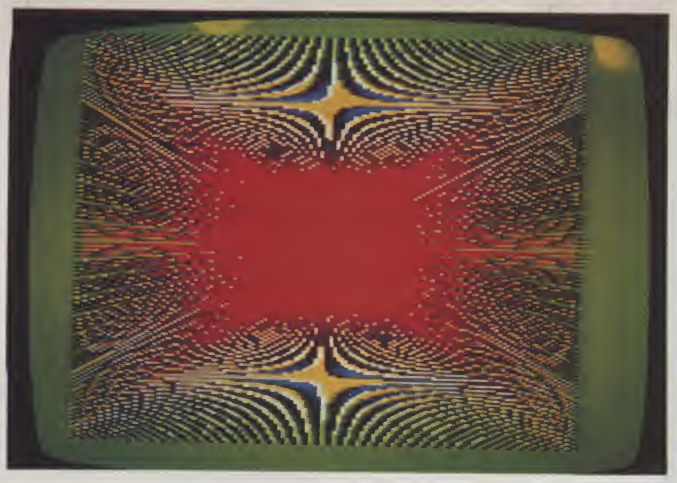
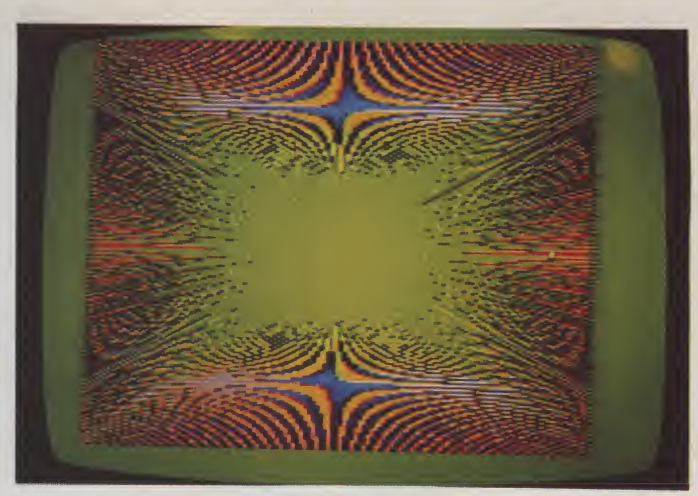


Photo 7. The ground grid, viewed straight on, but from a height.





Photos 9 and 10. Moire patterns, generated by Basic and the SubLogic UGI in the 128 by 192 color graphics mode.

with. I've written a few programs to interface the UGI to North Star Basic using normal Basic commands. The Spectrum's graphics, combined with Basic's math capabilities, makes for very interesting displays (for a few examples, see Photos 8, 9 and 10).

I've also recently written a program to interface the 3D converter package to Cromemco's JS-1 joystick. This allowed me to display a three-dimensional object and view it by simply moving the joystick. I'm currently writing a mini-assembler for the 3D converter which will update displays as they are typed in.

One lesson I've learned, however, is that a good television or monitor can make all the difference between good and great displays. When I first obtained the Spectrum, I was using a set which, while not bad, wasn't all that good. I then purchased a 13 inch Zenith color portable, which gave much better results. Because I'm not currently using an rf modulator, I'm experiencing "herring-bone," or horizontal to vertical lines on the display. This is caused by interference from the computer's clock signal. I've been told that this should be taken care of if a proper rf modulator is used. ■

↙See List of Advertisers on page 146

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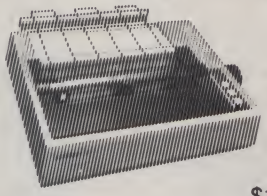

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Apple Logo Spoken Here

With support from such industry giants as Apple Computer, the Logo language is spreading.

The Logo programming language was a prominent feature at the recent West Coast Computer Faire, especially the newly released Apple Logo. As hinted in our March issue ("Logo: Not Just for Kids," *Microcomputing*, March 1982, p. 96), Apple Computer's own version of Logo was developed by Logo Computer Systems, Inc. (LCSI). Taking a look at Apple Logo also provides us with an opportunity to say a little more about Logo in general.

> Apple Logo is a fine version of the language with excellent documentation.

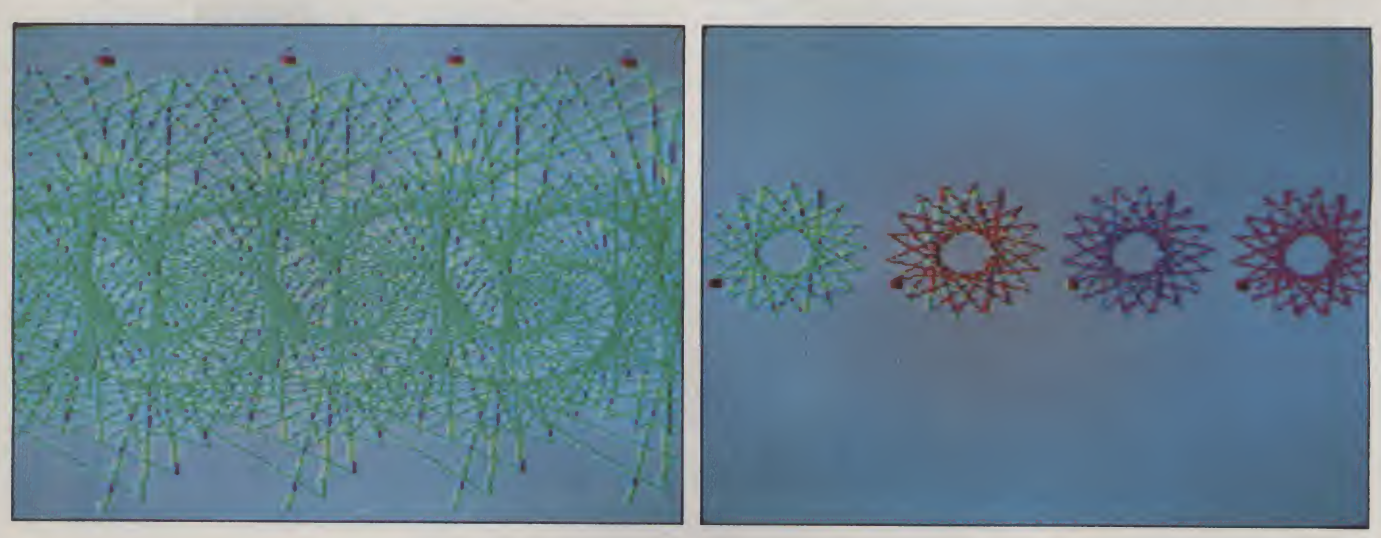
Apple Logo Features

This version of Logo includes, as do the others, color turtle graphics. The Logo turtle can draw lines in any of six colors on backgrounds of various colors. Not all combinations of the turtle's pen colors and the background colors produce visible graphics, but this is clearly noted in the Apple Logo documentation.

When Apple Logo is started up it loads a file of procedures into your workspace. This file contains procedures for having the turtle draw arcs and circles. (These procedures are listed and discussed in the documentation.) These procedures could be written into the other versions of Logo—it is handy having them readily available.

The documentation, by the way, is extremely good. Some Apple staffers feel that it is the finest documentation to accompany any of Apple's products. The documentation, consisting of two books, was also prepared by LCSI. The beginner's manual, *Apple Logo: Introduction to Programming through Turtle Graphics*, was written by Cynthia Solomon. The *Apple Logo Reference Manual* was written by Laurence Davidson. Both authors were previously members of the Logo Group at MIT and have a solid background in Logo.

Apple Logo also has edit and text modes as do the other versions of Logo. In addition to the arc and circle drawing procedures that are loaded



Photos 1a and 1b. Apple's newly-designed board will add TI-type sprite graphics to Apple Logo.

Reader Service for facing page ↙267→

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with Logo, a procedure called Readword that outputs the first word entered is included. Again, a handy procedure to have available.

There are also primitives in Apple Logo not found in the other versions.

Using Logo

Logo is a general-purpose language and learning tool for any age group. That is not to say it is the answer for everything. You wouldn't want to use it for long business or scientific applications programs requiring a lot of speed. But it could be helpful in working out problems to be handled by such applications programs.

Using one language to aid in work with another is in fact a strategy currently being used by LCSI in designing microcomputer versions of Logo. Gary Dressier from LCSI has written a Logo model in Lisp on a large Lisp machine which they use for this purpose.

Apple Logo Today and Tomorrow

Apple Logo is a fine version of the language with excellent documentation. But LCSI is currently developing two boards for the Apple, shown for the first time at the West Coast Computer Faire, that will further enhance Apple Logo. It hasn't yet been determined who will market these boards.

One of the new boards is a 64K-byte memory expansion card that will give you a 128K Apple II. The second board adds TI-style sprites to Apple Logo. This uses the TI 9918A video generator chip, which is a newer version of the 9918 used in the TI 99/4(A) computer. In addition to providing for sprite graphics, the new chip allows the sprites, or whatever they will eventually be called by LCSI, to draw like the Logo turtle. Photos 1a and 1b show some examples of such multiple turtle graphics.

I wish the names of several of the primitives had been kept closer to those of the other versions, for the ease of young people who may be working with different Logo versions. But even this is not without remedy. Renaming the primitives is simple, and the Apple Logo documentation tells you how to do it.

The appearance of Apple Logo virtually guarantees that other micro manufacturers and software producers will very soon be jumping on the Logo bandwagon.■

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Make Music With the Atari

It won't win you a Grammy Award, but with this chord organ program you'll begin to appreciate the music capability of the Atari.

By William L. Colsher

Syntax: SOUND *voice, note, tone, volume*

voice: Voice is an integer from 0 to 3 that selects the synthesizer voice to be turned on by this statement.

note: Note is an integer from 0 through 255 that tells the synthesizer what note to play. Higher numbers give lower notes. Table 2 lists some of these numbers and the musical notes they correspond to.

tone: Tone is an even integer from 0 through 14. A value of 10 gives a normal sounding note.

volume: Volume is an integer from 1 through 15. When more than one voice is being used the total volume should not exceed 32.

Table 1. Parameters of the Atari's Sound statement.

Just about every microcomputer has some kind of sound generator. The Apple II and Apple III have built-in speakers, as does the Hewlett-Packard HP-85. You can even make music of a sort by using the cassette port of a TRS-80. But none come close to the capabilities of the Atari 400 and 800. Built into each Atari is a four-voice synthesizer. Each voice is able to sound a single note at various volumes and with various tonal qualities, independent of the other three. The voices are controlled with the Sound statement, outlined in Table 1.

Since you can sound four separate notes at one time, you can play musical chords. This program shows one way of doing this.

A chord consists of at least three notes (all the chords used here have three notes). It would be tedious and inefficient to explicitly code all three notes of each of four chords for every one of the 12 notes of the scale. Fortunately, there is a definite relationship between the tonic, or main note of a chord, and the other notes. Therefore, you need only know the tonic and the type of chord to be played.

Table 3 shows the numerical relationships of the tonic to the other notes in the four chords I've chosen for this program. Once you know these relationships, it is a simple matter to write the program.

Conveniently, the Atari keyboard is 12 characters wide, not including control keys (A,S,D,F,G,H,J,K,L,;, + and * on the home row). You can read the Atari keyboard on the fly, but unfortunately the value returned is not the ASCII value of the character selected. Table 4 shows the values returned for each key used in this program, as well as the note or chord selected by that key. Lines 200 through 260 set up these relationships for the program.

Lines 1000 through 1120 are where the program spends most of its time. If no key has been pressed, the PEEK(764) statement returns a value of 255. After a keypress, you must reset that location to 255. This is done in line 1110 and the next to last state-

Note	Sound Number
A	144
B♭	136
B	128
C	121
C#	114
D	108
E♭	102
E	96
F	91
F#	85
G	81
A♭	76

Table 2. The Sound statement number corresponding to the notes of the octave starting with A below middle C.

Address correspondence to William L. Colsher, 1711 Robin Lane, Lisle, IL 60532.

Chord	Second Note Multiplyer	Third Note Multiplyer
Major	.79166	.66666
Seventh	.79166	.5625
Minor	.84027	.66666
Minor Seventh	.84027	.5625

Table 3. Multiplication factors of the tonic that produce the second and third notes of the various chords.

Key Pressed	PEEK(764)	Note or Chord Played
A	63	A
S	62	B♭
D	58	B
F	56	C
G	61	C#
H	57	D
J	1	E♭
K	5	E
L	0	F
:	2	F#
+	6	G
*	7	A♭
1	31	Major
2	30	Seventh
3	26	Minor
4	24	Minor Seventh

Table 4. Correspondence between the Atari's keys and the notes or type of chord produced in the PEEK (764) statement in line 1000 of Listing 1.

```
10 DIM REALTONE(12,2)
100 LASTBYTE=0
200 REM ***SET UP REAL NOTE ARRAY
210 FOR I=1 TO 12
220 READ A,B
230 REALTONE(I,1)=A:REALTONE(I,2)=B
240 NEXT I
250 DATA 63,144,62,136,58,128,56,121,61,114,57,108,1,102,5,96,0,91
260 DATA 2,85,6,81,7,76
1000 BYTE=PEEK(764):REM ***READ KEYBOARD
1010 IF BYTE=255 THEN GOTO 1000:REM ***NO KEY PRESSED
1020 IF BYTE=31 THEN GOTO 2000:REM ***MAJOR CHORD
1030 IF BYTE=30 THEN GOTO 2100:REM ***SEVENTH CHORD
1040 IF BYTE=26 THEN GOTO 2200:REM ***MINOR CHORD
1050 IF BYTE=24 THEN GOTO 2300:REM ***MONOR 7 CHORD
1060 REM ***CHECK FOR NOTE CHANGE
1070 IF BYTE=LASTBYTE THEN GOTO 1000
1075 LASTBYTE=BYTE
1080 FOR I=1 TO 12
1090 IF BYTE=REALTONE(I,1) THEN TONE=REALTONE(I,2)
1100 NEXT I
1110 POKE 764,255:REM ***RESET KEYBOARD
1120 GOTO 1000
2000 REM ***PLAY MAJOR CHORD
2010 SOUND 0,TONE,10,8
2020 SOUND 1,INT(TONE*0.79166+0.5),10,8
2030 SOUND 2,INT(TONE*0.66666+0.5),10,8
2040 POKE 764,255
2050 GOTO 1000
2100 REM ***SEVENTH CHORD
2110 SOUND 0,TONE,10,8
2120 SOUND 1,INT(TONE*0.79166+0.5),10,8
2130 SOUND 2,INT(TONE*0.5625+0.5),10,8
2140 POKE 764,255
2150 GOTO 1000
2200 REM ***MINOR CHORD
2210 SOUND 0,TONE,10,8
2220 SOUND 1,INT(TONE*0.84027+0.5),10,8
2230 SOUND 2,INT(TONE*0.66666+0.5),10,8
2240 POKE 764,255
2250 GOTO 1000
2300 REM ***MINOR 7 CHORD
2310 SOUND 0,TONE,10,8
2320 SOUND 1,INT(TONE*0.84027+0.5),10,8
2330 SOUND 2,INT(TONE*0.5625+0.5),10,8
2340 POKE 764,255
2350 GOTO 1000
```

Program listing. Chord organ program for the Atari.

ment of each of the chord-maker routines.

If a key has been pressed, the program checks first to see if it was a chord-select key (1 through 4). If so, it jumps to the appropriate routine and plays the selected chord using the last tone selected. This corresponds to the way chord names are written out. To play a D-minor chord you would first touch the H key to select a D note and then the 3 key to select a minor chord.

If the key pressed was not a chord-select key, the program examines its table of notes and key values (from Table 4) and, if the key value is found, sets the variable Tone to the corresponding value. This does not change any chord being played.

This program only begins to explore the musical abilities of the Atari. If you'll refer again to Table 1, you'll notice that there is a volume control parameter in the Sound function. Perhaps the up and down arrows on the keyboard could control that. You'll also notice that I've used only three of the four voices. A second "manual" could be added that plays single notes using the fourth voice. The tone parameter in Sound can produce some pretty weird noises —a rhythm section could be added using the fourth voice. Finally, you can always add more chords.■

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Sorcerer Secrets Revealed

An investigation into Exidy's Word Processor Pac discloses new, important memory addresses, formats and other methods of operation with which you can enhance the system's word processing capability.

By Bryan Lewis

The best reason for owning an Exidy Sorcerer is its word processing capability. An excellent machine-language program sold by Exidy (in the form of a read-only-memory cartridge called a Rom Pac) provides valuable text editing features such as block deletion or insertion, block moves and selective search-and-replace. The user is given complete control of tabs, line length and page length.

Ordinary user commands such as PRINT or SAVE can be entered on a separate line at the top of the screen. (That mode of operation is called the command mode, to distinguish it from normal full-screen text entry in the edit mode.) Less ordinary commands can be embedded within the text, for dynamic operations such as changing print parameters on the fly or ejecting the page. These embedded commands show up as peculiar graphic shapes on the screen, and are referred to as graphics commands.

Yet another feature, and one that isn't widely known, is user extendability. The value of that will be seen throughout this article. (If you'd like more background information than I've given here, see the article "Do the Job for Less" by Steven Guralnick in the March 1980 issue, p. 110.)

The Bad News

I recently disassembled a large portion of the Word Processor Pac, trying to understand how it handled proportional spacing, boldfacing, subscripting and all the other fancy operations mentioned in the user's manual from Exidy. Like any other computer owner, I wanted my system to have every possible option; I thought its inability to do those things was a result of mere ignorance. After all, my printer (a NEC Spinwriter) was capable of microscopic carriage control with the best of them.

The most surprising discovery I made is that the Rom Pac will *not* do boldfacing, proportional spacing, subscripting or superscripting. Don't believe everything the user's manual tells you! You must add extra software of your own to implement those features; the best that can be said of the Rom Pac is that it is extendable.

Another way to get the extra features is to add smart hardware. A Diablo printer, for example, can be educated by adding specially programmed read-only memory. Other smart printers are appearing on the market now, such as the Xymec and the Centronics 737. One advantage to the hardware solution is speed—your computer doesn't have to send a multitude of control characters to the printer. The disadvantage is cost, especially if you already own a semi-smart printer, as I did.

More bad news. Some of the graphics commands won't work within a line of text, but must be on a line all by themselves; the form feed (GRAPHIC-1) and reformat (GRAPHIC-5) are examples.

The mark (GRAPHIC-9) is supposed to serve as a place marker, to automatically halt the execution of large-scale commands such as forward, backward, delete and print. It does its job for the first three, but it does not halt printing. Fortunately, several of the commands *will* stop printing: GRAPHIC-8 designates the end of text, and GRAPHIC-2, 3 and 4 are treated as errors. When the Pac encounters one of the latter commands during printing, it pauses to ask your judgment on the error: to continue printing (hit return) or to abort (hit the escape key).

This makes possible a kludge method for subscripting: insert a "wrong" graphic command, then the

Byte	Significance
01-0B	Number of spaces to print between two words. Used in the print buffer if extra spaces are needed for justification.
0C	Hard hyphen occurring at end of a line.
0D	Carriage return. A line feed is not stored along with it, as is the case with some other editors (such as CP/M's).
0E	Soft carriage return for lines longer than the specified page width. End of the line on the video screen.
10-19	Embedded graphic commands. GRAPHIC-1 is 10, GR-2 is 11, and so on. GR-0 is 19.
1D	Soft hyphen.
1F	Indentation marker. An indented block of text begins with a three-byte code: 1F ©number of spaces to indent□ 1F.
7F	Deleted character. All 7Fs are erased when the user presses the clear key.
80-FE	Underlined characters. If the high bit is one (that is, 80H), the remaining seven bits are an ASCII character to be underlined.

Table 1. The meanings of nonalphanumeric codes. These are stored in the text and print buffers along with the normal ASCII characters to signify formats and special operations. All the codes are given in hexadecimal form.

Bryan Lewis is general manager for Word Processing Services, R.D. 3, Box 385, Putnam Valley, NY 10579.

subscript, then another command. When the printer pauses at each command, position the paper manually, and then hit return to resume. If you have a Centronics-style printer which buffers a line at a time, your procedure will be more involved; at the pause, the preceding characters on the line are still sitting in the line buffer waiting for a carriage return.

My solution to this subscripting problem will, in a moment, serve as an illustration of how to add your own features. But first I need to cover a little more background.

Canned Output Routines

The Word Processor Rom Pac contains two ready-made printer drivers, one using the Sorcerer's serial port and the other the parallel port. The serial printer driver starts at hexadecimal address DE90. The parallel driver, at address DE70, is designed for a Centronics-like printer (such as my Spinwriter).

A characteristic of the latter driver is that it filters out and discards line feeds, because parallel printers usually supply their own line feeds after receiving a carriage return.

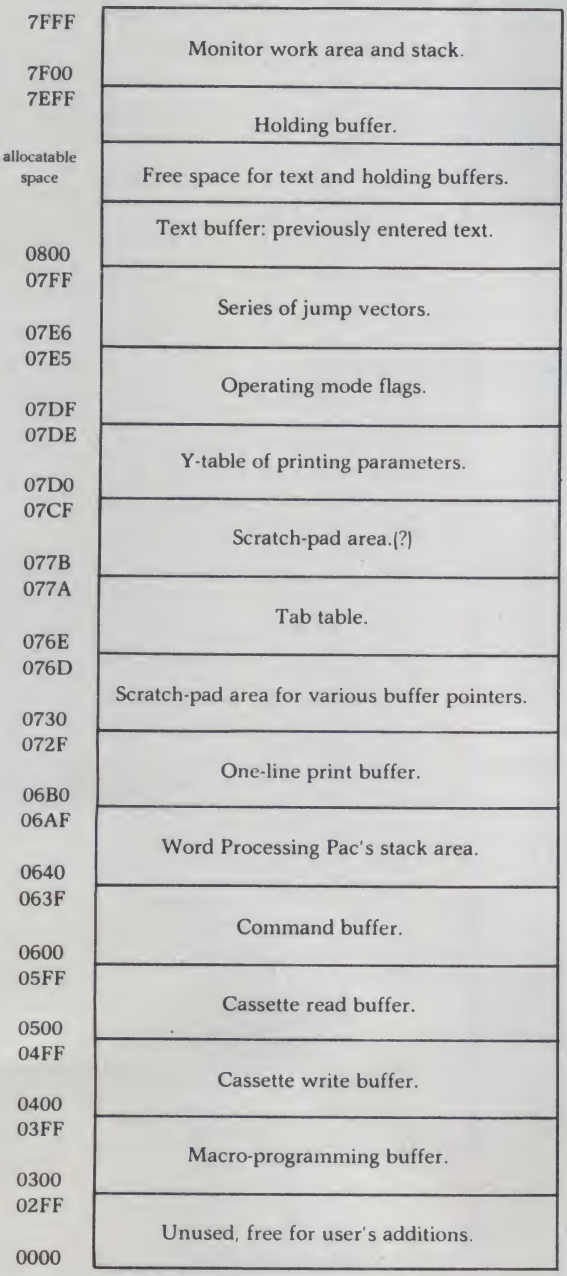

Fig. 1. Memory map showing the partitioning of RAM by the Word Processor Pac. A Sorcerer with 32K bytes of memory is assumed for illustration; the top three addresses will be different for other systems. The top half of the available 64K is not shown; it includes the Rom Pac itself, video RAM, the power-on monitor and character generators.

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Since, however, we *want* to produce line feeds for the purpose of subscripting, we must use the following short modification in Z-80 assembly language. It jumps into the parallel driver immediately after the linefeed filter.

```
F5          PUSH AF
C3 75 DE    JP CENTRX+5
```

Now, the normal way to access one of those output routines is to select a value in a table, the so-called Y-table. Choosing Print Device 1 specifies the serial driver; Print Device 2 specifies the parallel one. The Rom Pac will then send its stream of individual characters to the chosen output port.

Neither choice is really right for our purposes, though. It's difficult to make large-scale format changes when we're catching one character at a time. We would rather get our hands on a whole line at a time, in some sort of print buffer. And we can do that by selecting Print Device 0.

Print Device 0 does nothing. (If it seems only natural to you that Device 0 does nothing, then you haven't read the Exidy Manual. The secret of this nondevice is very well hidden.) The Pac carefully avoids doing *anything* to the line of text, to make sure it doesn't interfere with whatever fancy driver routine you're using for a daisywheel printer. Device 0 doesn't even send out the individual characters as the other devices do.

Here's how it works. Location 07DC is reserved for a jump to a printer driver. The default is C9—i.e., a do-nothing return—but you can change it to C3 70 DE for a parallel, or to C3 90 DE for serial output, or to your own jump. But the only characters sent to that location are spaces, vertical tabs and carriage returns, for indenting, tabbing, ejecting the page, etc. I suspect they're handled separately like this in case you have a Diablo-style printer with separate platen control lines.

What about the rest of the characters? A print buffer at 06B1 is filled with a line at a time. Nothing is done with the line: no justifying, no acting upon graphics commands. The Pac

Program listing. Z-80 assembly-language output routine for Print Device 0.

```
                        0001 ;       W.P. PAC ENHANCEMENT     BY BRYAN LEWIS
                        0002 ;
                        0003 ;       An output routine for Print Device 0.  Retrieves
                        0004 ;       characters from the print buffer and sends them to the
                        0005 ;       printer, except subscript and superscript command
                        0006 ;       tokens are converted to the proper escape sequences
                        0007 ;       for carriage control.  Written for a Spinwriter, but
                        0008 ;       easily modifiable.
                        0009 ;
                        0010 ;-------------------------------------------------------------
                        0011 ;
                        0012 ;       Define a few characters:
                        0013 ;
>000D                   0014 CR      EQU     0DH     ;Carriage return.
>000A                   0015 LF      EQU     0AH     ;Line feed.
>001B                   0016 ESC     EQU     1BH     ;Escape.
>0012                   0017 SUB     EQU     12H     ;The token for the subscript command.
>0013                   0018 SUPER   EQU     13H     ;The token for superscript.
                        0019 ;
                        0020 ;       And a few addresses:
                        0021 ;
>DE70                   0022 CENTRX  EQU     0DE70H  ;Centronics driver in the WP Pac.
>06B1                   0023 PBUFFR  EQU     06B1H   ;Origin of the one-line print buffer.
                        0024 ;
                        0025         ORG     0000H   ;Put in free memory.
                        0026 ;
                        0027 ;       --------   The main loop   --------
                        0028 ;
'0000  D5               0029         PUSH    DE              ;Preserve the registers we're
'0001  E5               0030         PUSH    HL              ;  going to wipe out.
'0002  21B106           0031         LD      HL,PBUFFR       ;Start at buffer start.
'0005  7E               0032 REPEAT  LD      A,(HL)          ;Get the character pointed to.
'0006  FE0D             0033         CP      CR              ;If it's a CR, that's the
'0008  CA1C00'          0034         JP      Z,DONE          ;  end of the buffer.  Done.
'000B  FE12             0035         CP      SUB             ;If it's a subscript token,
'000D  CA2000'          0036         JP      Z,DOWNSH        ;  go do a downshift.
'0010  FE13             0037         CP      SUPER           ;If it's a superscript token,
'0012  CA2900'          0038         JP      Z,UPSH          ;  go do an upshift.
'0015  CD70DE           0039 NORMAL  CALL    CENTRX          ;Anything else, normal output.
'0018  23               0040 NEXT    INC     HL              ;Increment pointer to next.
'0019  C30500'          0041         JP      REPEAT          ;And continue.
                        0042 ;
                        0043 ;       --------   End of main loop   -----
                        0044 ;
'001C  AF               0045 DONE    XOR     A               ;Clear the flags to make sure.
'001D  E1               0046         POP     HL              ;Restore.
'001E  D1               0047         POP     DE
'001F  C9               0048         RET                     ;Done with the line.
                        0049 ;
'0020  114000'          0050 DOWNSH  LD      DE,HALFLF       ;Send out the sequence for a
'0023  CD3200'          0051         CALL    SEQOUT          ;  1/16 inch line feed.
'0026  C31800'          0052         JP      NEXT            ;Then back for more buffer.
```

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then hops to address 07E9, where you can put a jump to your own buffer-handler. The default content of 07E9 is a simple return; the characters are sent nowhere.

The Solution

Enough background. We now know how to access the print buffer and where to send the characters after we're through with them. We want to write a routine that does the following (outlined here in structured English):

```
REPEAT until the end of the buffer:
    Get a character from the print buffer.
    If it's a subscript command:
        OUTPUT the sequence of characters
        for a half-line-feed.
    If it's a superscript command:
        OUTPUT the sequence of characters
        for a negative half-line-feed.
    If it's a normal character:
        OUTPUT it.
```

The program listing shows this routine coded into Z-80 assembly language. Some fine points to note are:

- The embedded commands that stand for subscript and superscript are the hexadecimal values 12 and 13. (See also Table 1.)
- The seven-byte sequence that produces a half-line-feed on a Spinwriter is:

ESC-]-R to select half spacing,
LF to do it, and
ESC-]-W to resume normal spacing.

For a negative line feed, change the LF to ESC-9.

- The output routine we use for those special escape sequences is the one we saw earlier: Centronics with line feeds. For normal text output, however, we still use the canned driver, so that we don't get double-spaced lines.
- A carriage return is what marks the end of the print buffer.
- We don't send a return at the end of the line; that's handled separately for Device 0.

We store the code in the unused memory starting at 0000, and we put a jump to it at 07E9. We also need to put a jump to the parallel driver at 07EC (that's where the spaces and returns are sent). To clarify:

At 07E9: C3 00 00
At 07EC: C3 70 DE

For your system you might need to alter the escape sequences for your printer, or the output routine if yours is a serial device.

Other Solutions

It is relatively easy to expand the

method to handle boldfacing, shadow printing, automatic centering, form feeds and vertical tabs. Bidirectional printing is another natural extension, since a one-line buffer is already set up; just send to the printer the proper byte sequence to initiate right-to-left carriage motion, then output the buffer in reverse. If you feel really ambitious, you can try adding true proportional spacing.

Text Storage Formats

The text as you enter it is stored in a buffer which begins at 0800 hex. At the head of the buffer is a string of 14 0E bytes, followed by a 02 (ASCII for start-of-text, STX). Your text is stored from 080F up. At the end comes an end-of-text character (ETX, 03) and a trailer of 15 0E bytes.

Text is stored in memory essentially as ASCII characters. The nonalphanumeric ASCII codes (less than 32 or greater than 127 decimal) signify special operations, as shown in Table 1. You'll see in the table the familiar tokens for the sub- and superscript commands.

Notice the efficiency of the text and command storage. Indentation of an

Listing continued.

```
                        0053 ;
     '0029  114800'     0054 UPSH     LD      DE,RHALFLF      ;Send out the sequence for a
     '002C  CD3200'     0055          CALL    SEQOUT          ;  1/16 inch reverse LF.
     '002F  C31800'     0056          JP      NEXT            ;Then back for more buffer.
                        0057 ;
     '0032  1A          0058 SEQOUT   LD      A,(DE)          ;This sends a byte sequence.
     '0033  FE00        0059          CP      0               ;  starting at pointer in DE
     '0035  C8          0060          RET     Z               ;  and ending at zero marker.
     '0036  CD3C00'     0061          CALL    CENTRLF         ;Uses Centronics with LF's.
     '0039  13          0062          INC     DE              ;Next.
     '003A  18F6        0063          JR      SEQOUT-$
                        0064 ;
     '003C  F5          0065 CENTRLF  PUSH    AF              ;A trick to jump into the
     '003D  C375DE      0066          JP      CENTRX+5        ;  driver after its LF filter.
                        0067 ;
                        0068 ;
                        0069 ;        The escape sequences for Spinwriter carriage movement:
                        0070 ;
     '0040  1B          0071 HALFLF   DEFB    ESC
     '0041  5D          0072          DEFB    ']'
     '0042  52          0073          DEFB    'R'
     '0043  0A          0074          DEFB    LF
     '0044  1B          0075          DEFB    ESC
     '0045  5D          0076          DEFB    ']'
     '0046  57          0077          DEFB    'W'
     '0047  00          0078          DEFB    0
     '0048  1B          0079 RHALFLF  DEFB    ESC
     '0049  5D          0080          DEFB    ']'
     '004A  52          0081          DEFB    'R'
     '004B  1B          0082          DEFB    ESC
     '004C  39          0083          DEFB    '9'
     '004D  1B          0084          DEFB    ESC
     '004E  5D          0085          DEFB    ']'
     '004F  57          0086          DEFB    'W'
     '0050  00          0087          DEFB    0
ERRORS=0000

CENTRL      003C CENTRX      DE70 CR          000D
DONE        001C DOWNSH      0020 ESC         001B
HALFLF      0040 LF          000A NEXT        0018
NORMAL      0015 PBUFFR      06B1 REPEAT      0005
RHALFL      0048 SEQOUT      0032 SUB         0012
SUPER       0013 UPSH        0029
```


✓See List of Advertisers on page 146

entire subparagraph requires an overhead of only three bytes. Line feeds are not stored. Space filling for right justification does not take up any extra room, nor does underlining. Very compact.

The one-line print buffer also uses many of the codes in Table 1. It occupies the space from 06B1 through 072F hex. Location 06B0 is a justification flag; it contains a 1 if the line needs space-filling for right justification. The print line in the buffer always ends with a carriage return.

The memory area between 0730 and 07FF is used as a scratch pad for all the operating parameters. Table 2 lists the secrets of the work area, as far as I've been able to unravel them. The major functional areas are:

- a storage area for buffer pointers
- a tab table
- a table of print parameters
- a series of jump instructions for user-definable print vectors.

Fig. 1 is a memory map, showing those functional areas and others in the Sorcerer.

Exploring Further

Several other nice features can be added to the Word Processor, beyond the print-formatting extensions discussed above. You can, for example, write your own global commands. When the Pac receives one of the four undefined letters (G,J,N,O) or a non-letter, it jumps to 07EF. Since that's in user memory (RAM), it's modifiable. You can insert a jump to your own execution routine. You could install a help function (display a list of legal commands), or a word-counting function (if you get paid by the word). The structured-English foundation for your command processor might look like:

```
Examine the command, using the command
  buffer and its pointer. (See Fig. 1 and Table
  2.)
If it's a '?':
  Go to the HELP function.
If it's an 'N':
  Go COUNT the words.
If it's anything else:
  Return to the INVALID message in the Pac.
```

Another idea. Now that you know where the text is stored in memory, it is relatively easy (and I've done it) to write a modem transmission routine; take bytes beginning at 0800 hex and send them out the Sorcerer's serial port one at a time, until the end-of-text byte is encountered. (For a similar technique, see the article "Use Your Exidy as a Smart Terminal" by Ernest Bergmann in the July 1980 issue, p. 142). Put someone with another Sorcerer and Word Processor Pac at the other end of the phone line, and presto—electronic mail! Or a distributed word-processing business, with all your employees working in their own homes.

If you have ideas of your own, here are some more canned routines in the Rom Pac that might come in handy (all addresses in hexadecimal):

CC0A—Sets up reverse-video (black-on-white) characters.

DE4E—Keyboard input. (This is the part of the Pac contributed by Exidy. The rest was written for Exidy by Testan Scientific.)

CF52—Beginning of command execution table.

If you want to dig deeper into the Pac on your own, the table at CF52 contains the execution addresses for all the commands. For instance, the first two bytes (at CF52) are B1 D4, so the routine to handle the "A" command starts at D4B1. The two bytes at CF54 form the address for the B command, and so forth.■

Locations	Function
0730-073A	Miscellaneous controls and flags.
073B	Page title working byte. Loaded with page title value (from 07D4) at start of each page.
073C-073F	?
0740-0741	Cursor location in video RAM, from F080 to F7FF.
0742-0743	Address of top of text buffer and bottom of holding buffer.
0744-0745	Address of top of holding buffer.
0746-0747	Text pointer, to start of present line.
0748-0749	Pointer to start of next line.
074A-074B	Pointer to end of text.
074C	Post-command parameter, for example, 55 in the command "P55" to print 55 lines.
074D	?
074E	Cursor location. (074E) + (0751) = position of cursor within present line.
074F	A print parameter. (?)
0750	?
0751	Cursor location. See 074E.
0752-0755	Indentation values. (?)
0756-0757	?
0758-0759	Print buffer pointer, from 06B0 to 072F.
075A-0762	?
0763-0764	Command buffer pointer, to next command in a series.
0765-0766	Pointer to origin of command buffer, 0600.
0767	Pre-command parameter: number of times to execute a command line.
0768-076D	?
076E-077A	Tab table. The default tabs are 10, 20, . . . , 120 (in decimal), so this table in memory initially contains 0A, 14, . . . , 78. It ends with the byte FF as a delimiter.
077B-07CF	?
07D0-07DE	Y-table. The table of print values such as page length, margins and line spacing.
07DF	Print flag. If this is zero, characters aren't sent to the printer (for verifying).
07E0	A print parameter. (?)
07E1	Line length. Default 63 decimal = 3F hex.
07E2	Cassette baud rate. Default = 40 hex for 1200 baud. 0 means 300 baud. No effect on serial printer baud rate.
07E3-07E4	Flags indicating whether a cassette write or read file is still open.
07E5	Mode flag, to indicate Command or Edit Mode. (?)
07E6-07E8	Output vector for Print Device 1. Default is C3 90 DE for serial printer.
07E9-07EB	Print vector for Device 0. Does not receive a character stream at all, as discussed in the text.
07EC-07EE	Output vector for Print Device 0, but normally receives only spaces and carriage returns.
07EF-07F1	User-definable vector for unused commands. Default = C3 86 CF = a jump to "INVALID ENTRY" message.
07F2-07F4	A jump vector called during cassette operations.
07F5-07F7	A jump vector called during cassette operations.
07F8-07F9	Initial value for the text pointer, 0800.
07FA-07FF	Unused. (?)

Table 2. An index to the working and control area of memory, with known functions and their locations.

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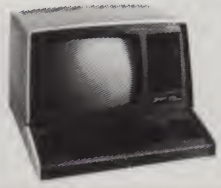

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Graphics Are Forever

Here's a programming shortcut to develop shapes—from geometric designs to complete character sets—that can be stored in memory and displayed on the screen when needed. In Applesoft for a 48K system.

By Steve Brown

I bought my Apple partly for its high-resolution graphics. But I found that the Applesoft manual's method for creating a shape table is inadequate. So I wrote my own program (see Program listing). Its features include the following:

- It accepts as input simple plot commands; for example, PL (plot a point and move left) and ND (no plot and move down).
- It converts these commands to the bit pattern necessary to draw the shape.
- It prints the data necessary to develop the shape table.
- It saves the shape table on disk for later use.

I wrote the program for a 48K Apple II Plus.

```
SHAPE-UP

SHAPE TABLE NAME -- SHAPE1    DEF.# -- 1

   LINE #  BYTE #  BINARY DATA  DECIMAL DATA  HEX DATA    MEMORY LOCATION
                                                        DECIMAL HEXIDECIMAL

      1       5     00110111         55          37       7680      1E00
      2       6     00101110         46          2E       7681      1E01
      3       7     00100100         36          24       7682      1E02
      4       8     00110101         53          35       7683      1E03
      5       9     00111110         62          3E       7684      1E04
      6      10     00000000          0          00       7685      1E05
      7      11     00000000          0          00       7686      1E06



INDEX DATA

START OF TABLE -- 1DFC HEX / 7676 DEC

  MEMORY LOCATION      DECIMAL DATA  HEX DATA
DECIMAL  HEXIDECIMAL

7676        1DFC              1         01
7677        1DFD              0         00
7678        1DFE              4         04
7679        1DFF              0         00

TOTAL MEMORY REQUIRED 11 BYTES

MEMORY LOCATIONS HEX E8 & E9 CONTAIN LOCATION
TO START OF SHAPE TABLE

LOC E8 HEX / 232 DEC = FC HEX / 252 DEC
LOC E9 HEX / 233 DEC = 1D HEX / 29 DEC


TO COMPLETE OPERATION OF PROGRAM
YOU MUST EXECUTE THE FOLLOWING

BLOAD BTABLE,A7676
      THEN
BSAVE SHAPE1,A7676,L11

TO UTILIZE THE SHAPE TABLE IN A BASIC PROGRAM,
INCLUDE THE FOLLOWING STATMENTS IN THE PROGRAM
PRIOR TO ANY 'HGR' COMMAND.

PRINT CHR$(4);"BLOAD SHAPE1"
POKE 232,252
POKE 233,29

YOU MUST ALSO PROTECT MEMORY LOCATIONS 7676 (1DFC HEX) TO 7686 (1E06 HEX)
WITH THE APPROPRIATE HIMEM OR LOMEM STATEMENTS
```

Sample shape table along with Basic statements and commands.

How It Works

Statement 5 sets HIMEM to 38000. This location begins the work area where the shape table is created. Statement 10 branches to statement 1590, where program initialization begins. But first, I'll describe two subroutines.

The first, in statements 20 through 160, converts any decimal number in variable DN into its four-byte hexadecimal equivalent as variable HN$. Statements 170 through 340 do the opposite by converting the hexadecimal number in variable HN$ to its decimal equivalent in variable DN.

Statement 1590 begins program initialization by clearing the screen. Then statements 1595 and 1596 set up X$ and Y$ for use in printer control. Statements 1600 and 1660 prompt you to enter variable SN, which is the number of individual shape definitions in the table. This entry must be in the range of 1 through 25. Statements 1670 to 1770 accept variable VL as an estimate of the number of

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plotting instructions needed to create the largest individual shape in the table. Valid entries are between 0 and 1000, with 0 assuming a default value of 200. This number is used to size the work arrays. In statements 1780 to 1810 you are prompted for the shape table name. Statements 1820 to 1822 dimension the arrays, which are used as follows:

HD$—Hexadecimal conversion
PV$—Input for plotting vectors
PL$—Table of input commands
PO$—Bit pattern representation of plot commands
ID$—Creation of shape table index
ID —Binary conversion
BT$—Shape table creation

The data in line 1840 is used by statements 1860 through 1880 to set the values in arrays HD$, PL$ and ID. Statements 1890 through 1920 convert the number of shape definitions to hexadecimal and place this value in the index (array ID$). Statements 1930 to 2090 prompt for entry of a starting memory location of the table. This can be entered as either a decimal number (enter the number only) or as a hexadecimal number (by ending the number with an H, such as 1DFCH). The proper conversion subroutine is then selected, and the decimal value of the start location is placed in variable SXOS and its hexadecimal equivalent in SXOS$.

This completes the program initialization. We then go to statement 350, where a FOR-NEXT loop based on the number of shape definitions begins the main program.

Statements 360 through 470 increment the plot vector count, display the entry instructions and accept variable PV$ (NN) as the next plotting vector. Statement 480 checks for entry of 00, which signifies the end of this definition. Statement 490 checks for reversed entry of the plot command (i.e., if PL is entered as LP the computer will accept the entry by reversing the characters in line statement 510). Statement 520 converts single-letter no-plot commands to their two-letter equivalents.

In statements 530 through 550, the array PL$ is searched to verify that a valid command has been entered. If the command is valid, the program jumps to line 580. If the command is invalid, lines 560 through 565 print a message, give an audible alert signal and return to line 470 to accept another entry.

Statement 580 clears any latent invalid entry message. Line 590 places the bit pattern corresponding to the command entered in array PV$. Statement 600 returns for entry of the next plot vector.

Statement 610 begins conversion of the individual bit-pattern commands into the final shape definition by setting the final element in array PV$ to zero. This is to ensure that the final vector in the definition will end properly. Variables BC and BD are set to zero in statement 610. BC is used as the byte counter; BD is used later in the program.

Statement 620 begins a FOR-NEXT loop to read array PV$ by increments of three elements. Statement 630 increments the byte count. Statement 640 creates the next element of array

Program listing. Program to develop high-resolution shape tables. For a 48K Apple II Plus.

```
1  REM  PROGRAM NAME SHAPE-UP
2  REM
3  REM
4  REM
5  HIMEM: 38000
10  GOTO 1590
20 D1 = 0:D2 = 0:D3 = 0:D4 = 0:D5 = DN
30  IF DN < 16 THEN 110
40  IF DN < 256 THEN 100
50  IF DN < 4096 THEN 70
60 D1 =  INT (DN / 4096)
70 D5 = D5 - (D1 * 4096)
80 D2 =  INT (D5 / 256)
90 D5 = D5 - (D2 * 256)
100 D3 =  INT (D5 / 16)
110 D4 = D5 - (D3 * 16)
120 HN$ = HD$(D1 + 1) + HD$(D2 + 1) + HD$(D3 + 1) + HD$(D4 + 1)
130  IF  LEN (HN$) = 4 THEN 160
140 HN$ = "0" + HN$
150  GOTO 130
160  RETURN
170  IF  LEN (HN$) = 4 THEN 179
171 HN$ = "0" + HN$
172  GOTO 170
179  FOR X = 1 TO 16
180  IF  MID$ (HN$,4,1) = HD$(X) THEN 200
190  NEXT X
200 D4 = X - 1
210  FOR X = 1 TO 16
220  IF  MID$ (HN$,3,1) = HD$(X) THEN 240
230  NEXT X
240 D3 = X - 1
250  FOR X = 1 TO 16
260  IF  MID$ (HN$,2,1) = HD$(X) THEN 280
270  NEXT X
280 D2 = X - 1
290  FOR X = 1 TO 16
300  IF  MID$ (HN$,1,1) = HD$(X) THEN 315
310  NEXT X
315 D1 = X - 1
320 DN = (D1 * 4096) + (D2 * 256) + (D3 * 16) + D4
340  RETURN
350  FOR DA = 1 TO SN
360 NN = 0
370  HOME
380 NN = NN + 1
390  VTAB 2: HTAB 2: PRINT "SHAPE TABLE -- ";SLNAME$;" / DEF # -- ";DA
400  VTAB 4: HTAB 2: PRINT "ENTER NEXT PLOT VECTOR"
402  VTAB 6: HTAB 2: PRINT "'00' TO END THIS DEFINITION"
410  VTAB 10: HTAB 2: PRINT "KEY 'P'-PLOT OR 'N'-NO PLOT FOLLOWED"
420  VTAB 12: HTAB 2: PRINT "BY DIRECTION TO MOVE (U,D,L,R)."
430  VTAB 14: HTAB 2: PRINT "(IF DIR. ONLY KEYED, 'NO PLOT' ASSUMED)"
440  VTAB 16: HTAB 4: PRINT "ENTRY OF MULTIPLE UP/NO PLOT COMMANDS"
450  VTAB 18: HTAB 4: PRINT "MAY CAUSE EARLY TERMINATION OF THIS"
460  VTAB 20: HTAB 4: PRINT "SHAPE DEFINITION"
470  VTAB 22: HTAB 2: INPUT PV$(NN)
480  IF PV$(NN) = "00" THEN 610
490  IF  MID$ (PV$(NN),2,1) = "P" THEN 510
500  GOTO 520
510 PV$(NN) =  MID$ (PV$(NN),2,1) +  MID$ (PV$(NN),1,1)
520  IF  LEN (PV$(NN)) < 2 THEN PV$(NN) = "N" + PV$(NN)
530  FOR X = 1 TO 13
540  IF PV$(NN) = PL$(X) THEN 580
550  NEXT X
560  VTAB 22: HTAB 2: PRINT PV$(NN);" IS AN INVALID ENTRY"
561  FOR TK = 1 TO 50
562 TL =  PEEK ( - 16336)
563  NEXT TK
565  GOTO 470
580  VTAB 22: HTAB 2: PRINT "                                "
590 PV$(NN) = PO$(X)
600  GOTO 380
610 PV$(NN) = "000":BC = 0:BD = 0
620  FOR RX = 1 TO NN STEP 3
630 BC = BC + 1
640 BT$(BC) = PV$(RX + 2) + PV$(RX + 1) + PV$(RX)
650  IF  LEFT$ (BT$(BC),1) = "1" THEN 680
660  IF  MID$ (BT$(BC),2,2) = "00" THEN 680
670  GOTO 700
680 BT$(BC) = "000" +  MID$ (BT$(BC),4,6)
685  IF  MID$ (BT$(BC),4,3) = "000" THEN RX = RX - 1
690 RX = RX - 1
700 BT$(BC) =  MID$ (BT$(BC),2,8)
710  NEXT RX
720  IF  LEN (BT$(BC)) = 8 THEN 750
730 BT$(BC) = "0" + BT$(BC)
740  GOTO 720
750 BC = BC + 1
760 BT$(BC) = "00000000"
762  PRINT X$;"PR#1"
763  PRINT Y$;"BON"
770  PRINT " "
771  PRINT "SHAPE-UP
772  PRINT " "
```

More

Listing continued.

```
780  PRINT "SHAPE TABLE NAME -- ";SLNAME$;"   DEF.# -- ";DA
800  PRINT " "
810  PRINT "   LINE #  BYTE #  BINARY DATA  DECIMAL DATA  HEX DATA    MEMORY LOC
ATION"
820  PRINT  TAB( 57);"DECIMAL HEXIDECIMAL"
830  PRINT " "
860  FOR CX = 1 TO BC
870 BD = 0:BX = 0:BY = 0
880 BX$ =  LEFT$ (BT$(CX),4):BY$ =  RIGHT$ (BT$(CX),4)
890  FOR IQ = 1 TO 4
900 BX = BX + (ID(IQ) *  VAL ( MID$ (BX$,IQ,1)))
910 BY = BY + (ID(IQ) *  VAL ( MID$ (BY$,IQ,1)))
920  NEXT IQ
930 DN = BX
940  GOSUB 20
950 BD$ =  MID$ (HN$,4,1)
960 DN = BY
970  GOSUB 20
980 BE$ =  MID$ (HN$,4,1)
990 BF$ = BD$ + BE$
1000 HN$ = BF$
1040  GOSUB 170
1050 BD = DN
1060 DN = SXOS + CX + IX - 1
1070  GOSUB 20
1080 SYO$ = HN$
1090  PRINT  TAB( 6);CX; TAB( 9 -  LEN ( STR$ (CX)));CX + IX; TAB( 10 -  LEN ( S
TR$ (CX + IX)));BT$(CX); TAB( 9);BD; TAB( 12 -  LEN ( STR$ (BD)));BF$; TAB( 8);S
XOX + CX + IX - 1; TAB( 11 -  LEN ( STR$ (SXOX + CX + IX - 1)));SYO$
1095  POKE 38000 + CX + IX - 1,BD
1100  NEXT CX
1101  PRINT Y$;"40N"
1102  PRINT X$;"PR#0"
1110 DN = IX
1120  GOSUB 20
1130 ID$(3 + (DA - 1) * 2) =  RIGHT$ (HN$,2)
1140 ID$(4 + (DA - 1) * 2) =  LEFT$ (HN$,2)
1150 IX = IX + BC
1160  NEXT DA
1161  PRINT X$;"PR#1"
1170  PRINT Y$;"80N"
1175  PRINT " "
1180  PRINT "INDEX DATA"
1190  PRINT " "
1200  PRINT "START OF TABLE -- ";SXOS$;" HEX / ";SXOS;" DEC"
1210  PRINT " "
1220  PRINT "  MEMORY LOCATION     DECIMAL DATA  HEX DATA"
1240  PRINT "DECIMAL  HEXIDECIMAL"
1260  PRINT " "
1270  FOR QX = 1 TO (2 * SN) + 2
1280 HN$ = ID$(QX)
1320  GOSUB 170
```

More

BT$ with a nine-character representation of the next three plot vectors. If a byte had nine bits, the program could continue with the next three input elements. Since this is not the case, the program must check to see if the first character is a 1. If it is, statement 680 sets the first three positions to 000; then lines 685 and 690 decrement the byte count. This moves the command to the next available byte in the table.

Statement 700 sets the final bit-pattern based on the rightmost eight characters. Statement 710 completes the FOR-NEXT loop. Statements 720 through 760 again ensure that the final byte of the shape definition contains all zeroes.

Statements 762 through 830 begin the print routine by printing the headings. Statements 860 through 1090 print the individual memory locations and associated data. Statement 1095 puts the decimal equivalent of the three plot vectors into memory. Statement 1100 completes the FOR-NEXT loop and returns to compute the next three plot vectors.

Statements 1101 and 1102 turn off the printer. Statements 1110 through 1150 compute the index value to start the next shape definition. Statement 1160 completes the FOR-NEXT loop begun in line 350 and returns for entry of the next shape definition.

Statements 1161 through 1558 print the shape table index. Statements 1559 to 1561 complete the program by saving the shape table on a disk as a binary file.

There is one final step in this process. Since the shape table is saved under the name "BTABLE" at memory location 38000, you must load the table into the proper memory location, then save it on disk under the proper name. The necessary commands to do this are shown in the sample run.

The shape table can now be used in any program. The Basic statements required to load the table from within a program are also shown in the sample run.

Program Operation

Upon running the program, you will be asked for the number of shape definitions in the table. Enter a number from 1 through 25. (The program could be modified to accept a larger number than this.) You will then be asked to enter an estimate of the number of plot vectors in the largest shape definition you intend to

process. Any number between 0 and 1000 is valid. If zero is entered, 200 is assumed, which is sufficient for most simple shapes.

Now the name of the shape table will be requested. Any name is valid. The next prompt will ask for a starting location for storage of the shape table. You can enter any number; however, it should be one where the table will not be destroyed by any program, graphics screens, etc. You can enter the number as a decimal (i.e., 7676) or as a hexadecimal number by ending it with an H (i.e., 1DFCH).

The program now asks you to enter the actual plot vectors. These commands are:

PL—Plot, move left
PR—Plot, move right
PD—Plot, move down
PU—Plot, move up
00—End of this shape definition
NL (or L)—No plot, move left
NR (or R)—No plot, move right
ND (or D)—No plot, move down
NU (or U)—No plot, move up

This phase will continue until all of the shapes you specified are defined.

I will again stress the necessity of avoiding a condition that could re-

Listing continued.

```
1330 I1 = DN
1340 DN = SXOS + QX - 1
1350  GOSUB 20
1360 I2$ = HN$
1370  PRINT SXOX + QX - 1; TAB( 12 -  LEN ( STR$ (SXOX + QX - 1)));I2$; TAB( 15)
;I1; TAB( 10 -  LEN ( STR$ (I1)));ID$(QX)
1375  POKE 38000 + QX - 1,I1
1380  NEXT QX
1420  PRINT " "
1430  PRINT "TOTAL MEMORY REQUIRED ";IX;" BYTES"
1440  PRINT " "
1450  PRINT "MEMORY LOCATIONS HEX E8 & E9 CONTAIN LOCATION"
1470  PRINT "TO START OF SHAPE TABLE"
1480  PRINT " "
1490 HN$ = "00E8": GOSUB 170:D8 = DN
1500 HN$ = "00E9": GOSUB 170:D7 = DN
1510 HN$ = "00" +  MID$ (SXOS$,3,2): GOSUB 170:D6 = DN
1520 HN$ = "00" +  MID$ (SXOS$,1,2): GOSUB 170:D9 = DN
1530  PRINT "LOC E8 HEX / ";D8;" DEC = "; MID$ (SXOS$,3,2);" HEX / ";D6;" DEC"
1540  PRINT "LOC E9 HEX / ";D7;" DEC = "; MID$ (SXOX$,1,2);" HEX / ";D9;" DEC"
1541  PRINT " ": PRINT " "
1542  PRINT "TO COMPLETE OPERATION OF PROGRAM"
1543  PRINT "YOU MUST EXECUTE THE FOLLOWING"
1544  PRINT " "
1545  PRINT "BLOAD BTABLE,A";SXOS
1546  PRINT "       THEN"
1547  PRINT "BSAVE ";SLNAME$;",A";SXOS;",L";IX
1548  PRINT " "
1549  PRINT "TO UTILIZE THE SHAPE TABLE IN A BASIC PROGRAM,"
1550  PRINT "INCLUDE THE FOLLOWING STATMENTS IN THE PROGRAM"
1551  PRINT "PRIOR TO ANY 'HGR' COMMAND."
1552  PRINT " "
1553  PRINT "PRINT CHR$(4);"; CHR$ (34);"BLOAD ";SLNAME$; CHR$ (34)
1554  PRINT "POKE 232,";D6
1555  PRINT "POKE 233,";D9
1556  PRINT " "
1557  PRINT "YOU MUST ALSO PROTECT MEMORY LOCATIONS ";SXOS;" (";SXOS$;" HEX) TO
";SXOS + IX - 1;" (";SYD$;" HEX)"
1558  PRINT "WITH THE APPROPRIATE HIMEM OR LOMEM STATEMENTS"
1559  PRINT X$;"PR#0"
1560  PRINT  CHR$ (4)"BSAVE BTABLE,A38000,L";IX
1561  END
1590  HOME
1595 X$ =  CHR$ (13) +  CHR$ (4)
1596 Y$ =  CHR$ (9)
1597  VTAB 10: HTAB 5: PRINT "SHAPE-UP (C) 1981 BY STEVE BROWN"
1598  FOR VV = 1 TO 2500: NEXT VV
1599  HOME
1600  VTAB 8: HTAB 5: PRINT "ENTER NUMBER OF SHAPES IN THIS TABLE"
1610  VTAB 10: HTAB 10: PRINT "(VALID ENTRIES -1 TO 25)"
1620  VTAB 12: HTAB 5: INPUT SN
1630  IF SN > 0 THEN 1632
```

More

✓See List of Advertisers on page 146

Listing continued.

```
1631  GOTO 1633
1632  IF SN < 26 THEN 1660
1633  VTAB 13: HTAB 10: PRINT SN;" IS AN INVALID ENTRY"
1634  GOTO 1620
1660  VTAB 13: HTAB 10: PRINT "                              "
1670  HOME
1680  VTAB 8: HTAB 2: PRINT "APPROXIMATLY HOW MANY PLOT VECTORS"
1690  VTAB 10: HTAB 2: PRINT "ARE IN THE LARGEST SHAPE DEFINITION?"
1700  VTAB 12: HTAB 2: PRINT "(MAXIMUM 1000)"
1710  VTAB 14: HTAB 2: PRINT "'0' WILL SET = 200 VECTORS"
1720  VTAB 16: HTAB 2: INPUT VL
1725  IF VL = 0 THEN VL = 200
1730  IF VL < 1001 THEN 1770
1750  VTAB 18: HTAB 2: PRINT VL;" IS AN INVALID ENTRY"
1760  GOTO 1720
1770  VTAB 18: HTAB 2: PRINT "                              "
1780  HOME
1800  VTAB 8: HTAB 2: PRINT "ENTER NAME TO ASSIGN THIS SHAPE TABLE"
1810  VTAB 10: HTAB 2: INPUT SLNAME$
1820  DIM HD$(16),PV$(VL +  INT (VL / 10) + 10 + (2 * SN))
1821  DIM PL$(13),PD$(13),ID$((SN * 2) + 4)
1822  DIM ID(4),BT$( INT (VL / 2) +  INT (VL / 10))
1840  DATA  0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F,00,000,PU,100,PR,101,PD,110,PL,111,N
U,000,NR,001,ND,010,NL,011,U,000,R,001,D,010,L,011,8,4,2,1
1860  FOR X = 1 TO 16: READ HD$(X): NEXT X
1870  FOR X = 1 TO 13: READ PL$(X): READ PD$(X): NEXT X
1880  FOR X = 1 TO 4: READ ID(X): NEXT X
1890 DN = SN
1900  GOSUB 20
1910 ID$(1) =  MID$ (HN$,3,2)
1920 ID$(2) = "00"
1930  HOME
1935  VTAB 8: HTAB 2: PRINT "ENTER MEMORY START LOC. OF SHAPE TABLE"
1940  VTAB 10: HTAB 2: PRINT "ENTER NUMBER ONLY IF DECIMAL,"
1960  VTAB 12: HTAB 2: PRINT "OR TERMINATE WITH 'H' IF HEXIDECIMAL"
1970  VTAB 14: HTAB 2: INPUT SXOS$
1980  IF  RIGHT$ (SXOS$,1) = "H" THEN 2010
1990 SXOS =  VAL (SXOS$)
1991 DN = SXOS
1992  GOSUB 20
1993 SXOS$ = HN$
2000  GOTO 2080
2010 SXOS$ =  MID$ (SXOS$,1, LEN (SXOS$) - 1)
2050 HN$ = SXOS$
2060  GOSUB 170
2070 SXOS = DN
2080 IX = 2 + (2 * SN)
2090  GOTO 350
2100  END
```

sult in a byte containing all zeroes. This immediately ends the shape-draw function. The primary cause of this is the entry of multiple up/no-plot commands. I suggest you start at the top of any shape and work down. If you must move up, do it in a zigzag pattern.

When you finish, the data will be converted, printed and saved on a disk as a binary file. You must then load the table at the proper memory location and save it under the proper name. All necessary commands for this are listed on the printout. Also listed are the necessary Basic statements to load the table from within a program.

I recommend that you use graph paper to design the shapes. It speeds up the process greatly.

This program is not a solution to all Apple high-resolution problems, but is a versatile tool for those of us needing to occasionally create shape tables. I have used it to create many shape tables, ranging from simple geometric designs to complete character sets. With modifications to some of the array sizes, virtually anything can be created.■

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Relief for the Problem Speller

Do misspellings and typos frequently sneak their way into your writing? Wipe them out with these spelling checker programs for the TRS-80.

By Allan J. Domuret

Anyone who has made it through high school knows that proofreading is an inseparable part of the writing process. If this is so, why is it that gross misspellings such as "congradulations," "formating," "verbatum" and "nemonic" continue to disgrace the pages of microcomputer magazines and, especially, microcomputer program documentation?

In all fairness, I should not exclusively criticize microcomputer-related correspondence, because misspellings and typos can be found in just about any printed or written document. Even well-seasoned writers manage occasionally to let a typo or misspelled word slip through. After all, writing can be tedious, and proofreading is even more so. It is easy to make mistakes.

But now there is help. To catch those misspelled words and sneaky typos, and for writers and authors who are averse to using dictionaries, the new computerized spelling dictionary programs can help eliminate or substantially reduce those embarrassing, and sometimes insulting, spelling errors. And, significantly, they do it fast.

I first became aware of these spelling dictionary programs in the early summer months of 1981 when there appeared in the micro magazines a number of ads for "spelling checker" or "dictionary" programs for the TRS-80. "Proofreader" is another name sometimes attached to these wonderful new utilities. What they all do, and quite effectively, is what their names imply—they automatically check computer-created ASCII text files for spelling errors. These spelling checker programs have got to be the greatest invention since sliced bread.

But no matter how benign the subject, there are always some who find fault. A few critics have confronted me with a challenge concerning the wisdom of putting another computerized tool into the hands of students—something similar to the recent concern about allowing students to use hand calculators in math classes. Is it not likely, they argue, that the availability of inexpensive computerized composition aids will deny students the motivation to learn how to spell?

I seriously doubt that the spelling dictionary programs will have any such adverse effects on students or authors. In fact, the use of these composition aids forces the operator into more frequent use of a dictionary to look up words flagged by the system as either misspelled or unknown.

Furthermore, those individuals who have substantial problems with spelling usually have other writing disabilities; hence, they avoid writing altogether and have no real need for spelling aids. And as for those masochists who choose to engage in the introverted sport of writing (usually for inadequate compensation), they will typically, and wisely, have their manuscripts proofed by friends, relatives or others before release to publishers. A computerized spelling dictionary simply provides one additional quick and easy method for detecting gross misspellings and typos. Thus, with misspellings and typos gone, proofreading can focus on improving clarity, syntax and grammar.

Dictionary Programs

But which computerized composition aid is "best"? What features do the various proofreading programs offer? And what DOS or word processor program incompatibilities are lurking within those mysterious machine code instructions, just waiting for a chance to clobber a valuable disk?

Let's compare and contrast (remember these words from that final exam in English literature?) four TRS-80 spelling dictionary programs: Hexspell by Hexagon Systems, Proofreader by Aspen Software (formerly called Soft-Tools), Chextext by Apparat and Microproof by Cornucopia Software.

The system I used to evaluate these programs was a TRS-80 Model I, with 48K, equipped with the latest Archbold speedup board (3.66 MHz CPU clock) and a Percom double-density disk drive system using both Shugart SA-400 35 track (the same drive provided by Radio Shack) and MPI 40-track drives. Evaluations were conducted in various combinations of double vs single density, and fast vs normal CPU clock.

Word processing programs used in the evaluation were limited to Scripsit/LC (by Radio Shack) and Electric Pencil (by Michael Shrayer). I used the NEWDOS-80 (versions 1 and 2) and LDOS 5.0 disk operating systems.

Before getting on with the particulars of each spelling checker package, the reader should be cautioned that these dictionary programs cannot check for syntax errors, sentence structure, grammatical violations and certain typos. The first three of these limitations should be obvious. As an

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example of the latter limitation, none of the programs can, nor should they be expected to, choose between such words as form and from; capitol and capital; to, two and too; forth and fourth; its and it's; and so on. They will flag errors such as "reciept," "congradulations" (thank goodness) and "fourty." But the author, as always, still bears responsibility for good grammar, readability and style.

Three of the four dictionary programs (the exception is Chextext by Apparat) have one common characteristic that deserves comment: dictionary files which are used to locate misspelled or unknown words are created in either a binary form or a coded ASCII form, both of which are virtually impossible to read or modify directly by way of Superzap or similar utilities. Presumably, the binary or ASCII-coding approach makes a program's proofreading process more efficient and faster than it would have been had the dictionary files been created in pure ASCII format. If any of the dictionary files are examined with Superzap, Debug, or what have you, they (the files) will look like gibberish or garbage.

This comment is not intended as a criticism; rather, it is intended to inform readers that they should not expect to be able to modify a proofreading dictionary file in the traditional way that one might expect to modify a typical ASCII file. The modification or updating task must be done with either a special dictionary maintenance file or system command provided with the spelling dictionary package.

Apparat's approach for their Chextext is to use ASCII dictionaries, rather than binary or coded ASCII dictionaries. The primary advantage with this approach is that the operator can easily verify the integrity of the entire dictionary and make appropriate changes. The disadvantage is that the dictionary occupies more disk space than a binary-coded dictionary.

All four programs let you add your own words or esoteric language to the dictionaries, and each uses its own method for automatically changing or expanding the dictionary files. More details on the dictionary expansion processes are provided in the following text.

A summary table of cost, special features, compatibilities and incompatibilities is provided in Table 1.

Hexspell

Hexagon Systems, PO Box 397, Vancouver, BC, Canada V6C 2N2. $69.

As is the case with all four of the spelling dictionary programs, Hexspell is easy to use. Its mode of operation requires the input of an existing Scripsit, Electric Pencil, or similarly created ASCII file, from which Hexspell proceeds to proofread the file while simultaneously writing it to the video monitor.

As Hexspell encounters and displays each alien or misspelled word in context, you're presented with three options; R for replace, S to skip (leave the word as is) or L for Hexspell to learn the word. When you use the R option, the corrected or changed word is immediately checked against the dictionary for correct spelling, and if the word is still an unknown, the three options are again offered. Hence, the modified word can be added to Hexspell's dictionary, or skipped, or changed again.

During the proofing process, Hexspell inserts all corrections into a twin work file. After the entire original text file has been checked, it is rewritten, with all corrections automatically inserted into the text. In other words, you don't have to go back into the original file to make the spelling corrections—it has already been done.

Although this process makes the proofreading effort quick and easy, there is always the danger that one or both of the files (the original text and the work file) being worked on will get clobbered. Consequently, I recommend that before proofreading any text file, a backup copy should be kept aside as a precaution.

A unique Hexspell feature is that single words can be deleted from their dictionaries under software control. For example, suppose I told Hexspell to learn an erroneous word like "reciept." If left in the dictionary, the misspelled "reciept" would pass as a valid word whenever encountered. Upon discovering the error later, I could remove the misspelled word from the dictionary and eliminate the problem.

Hexspell has one minor, and easily tolerated, shortcoming: prefixes and suffixes cause each word tense or derivative to be checked and/or learned as individual words. Thus, Hexspell treats words like proof, proofed, proofer and proofing individually. Convenience and speed would be improved if Hexspell could recognize prefixed, suffixed and other word derivatives without each appearing as a unique word. In fact, the only spelling dictionary system that does recognize the various derivatives of a

	Hexspell	Proofreader	Microproof	Chextext
Cost	$69	$54 to $84	$70 to $165	$59.95
Dictionary Size, in words	"About" 39,000	38,000	50,000	15,000
Speed**	Good	Better	Best	Good
Compatibility				
Double Density	Y	Y	Y	Y
TRSDOS	Y	Y	Y	Y
LDOS	Y	Y	Y	Y
NEWDOS-2.1	Y	Y	Y*	Y
NEWDOS-80 (V1 and V2)	Y	Y	Y*	Y
ULTRA-DOS	Y	Y	Y	Y
DOSPLUS	Y	Y	Y	Y
Scripsit	Y	Y	Y*	Y*
Pencil	Y	Y	Y*	Y*
Lazy Writer	Y	Y	Y	Y

Other DOS systems and word processors not verified.

**See text for additional comments.*

***Speed was evaluated subjectively, the reason being that too many variables can affect the speed of a spelling dictionary program on different TRS-80 configurations. For example: availability of one, two or more disk drives; availability of double density; availability of CPU clock speedup board; different inherent speed of various disk operating systems; number of alien words encountered by the spelling dictionary system (as a dictionary is used and expanded over time, it will cause the system to run faster as it "learns" esoteric words); dexterity of operator manipulation of alien words (Skip, Replace, or Learn); and so on. As for my TRS-80 configuration described in this article, a 12 gran text can be completely processed in less than five minutes by any of the systems. This rough speed statement includes a best guess for anticipated improvements to Proofreader and Chextext with planned upgrades.*

—A.D.

root word is Microproof. More on this later.

For its price of $69, Hexspell is a complete and very usable system; there is nothing more to buy. It is relatively inexpensive and works well for shorter text files. However, for someone who does a considerable amount of writing and has a correspondingly larger budget, one of the more expensive, and therefore more capable, spelling checkers might be a more rational choice. As spelling checker programs go up in price, so do they seem to provide somewhat more efficient and faster processing of text.

Technical considerations: Hexspell works perfectly with TRSDOS, NEWDOS-2.1, NEWDOS-80 and LDOS, in both single- and double-density modes where applicable. I presume, but cannot verify, that it will work with the other TRS-80 Model I disk operating systems such as ULTRADOS and DOSPLUS.

Hexspell is also compatible with virtually any TRS-80 Model I word processor such as Electric Pencil, Scripsit and Lazy Writer. There are no problems with Scripsit as upgraded by Superscript (Acorn), and there appear to be no incompatibilities deriving from program code zaps or patches, either commercial or user-originated, as installed into the various word processors' machine code.

Proofreader

Aspen Software, PO Box 339, Dept. E, Tijeras, NM 87059. $54.

Proofreader is designed to work on a 32K system with only one disk drive. Although the one disk drive may be an important operator consideration, the 32K limitation, in my mind, is hardly worth the bother, what with 16K of 200 ns chips now selling for under $20. There are, however, many TRS-80 owners who absolutely will not open the expansion interface for fear of either voiding the TRS-80 warranty or of being refused repair service by Radio Shack. Hence, some TRS-80 owners still have only 32K. At any rate, the one-drive capability may be an important consideration for some operators.

Proofreader consists of a main workfile called PROOFRDR/CMD, two binary-coded dictionary files and an auxiliary ASCII dictionary named, appropriately, AUXDICT/TXT (auxiliary dictionary). The two binary dictionary files contain the system's 38,000 word vocabulary in binary-

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New, Improved Relief

Hexspell 2

The price of this version is $99; the upgrade price to Hexspell Version 1 owners is only $35. Use of Hexspell 2 on the Model III is currently limited to owners of either LDOS or NEWDOS-80 Version 2. Conversion instructions are provided in the documentation.

Perhaps the most significant enhancements in Hexspell 2 are the programmable character set and longer word handling capability (up to 40 characters). The programmable character set allows definition and dictionary inclusion of unique and esoteric words, equations, codes or special character sets. Unique character set options include Greek and Japanese characters, some of which are directly accessible on the Model III. An example of a uniquely defined word might be:

$$-(dE/dx) = [NEZ(Z+1)e^4/137m^2c^4][41n(2E/mc^2)-4/3]$$

For the curious, this is an equation for radiative energy loss in high energy electron interactions. Note that since the unique word exceeds 40 characters in length, I broke it up with a few strategic spaces so that the segments could be stored in the user-definable dictionary.

These new Hexspell 2 features should prove to be especially useful to engineers, mathematicians, physicists, chemists and other professionals who have a need for specialized symbols or character representations in their text. Up to 22,000 words, either standard or unique, can be added to the user-expandable dictionary.

Proof-Edit and Grammatik

There are two additions to Aspen Software's Proofreader—Proof-Edit and Grammatik, priced for the TRS-80 Model I at $30 and $59 respectively. Model II and III are available at higher prices.

When my original article was written, Proof-Edit and Grammatik were not yet available. The primary features in Proof-Edit are automatic and manual updating, modification, or correction to both the master and user auxiliary dictionaries. Proof-Edit also enables the creation of specialized or unique master dictionaries which may be accessed by the software in lieu of the original master dictionaries.

Similar to Hexspell operation, Proof-Edit scrolls the text file on the screen to permit interactive user observance of unknown or misspelled words as they occur in context. During the edit process, the user may either correct the bad word or mark it for later reference or changes. Simultaneously, new or corrected words are automatically stored in a disk file for subsequent updating of the system dictionaries. Options are available to modify both the binary-coded dictionaries and the user's ASCII auxiliary dictionary.

Grammatik is an impressive newcomer to the spelling checker program scene. It has the ability to recognize and flag certain grammatical errors in the following categories:

- Phrases: checks are made for specific phrases commonly recognized as being poor or wordy usage.
- Sexist terms: flags about 100 words which might be construed as unacceptably sexist in contemporary text.
- Profiles: each different word in the document is listed with the total number of times it was used. Thus, excessive or repetitious use of a particular word becomes apparent.

Grammatik also checks for balanced quote marks and parentheses; doubled words (the the as sometimes happens at the end of one line and carries over to the beginning of the following line); inconsistent capitalization (e.g., FRogs are beautiful.); capitalization of the first word of a sentence; certain obvious punctuation errors; jargon; redundant phrases (e.g., seldom ever); and awkward usage The capabilities of this program are extensive.

Style is often a matter of taste, and the writer is, of course, free to

(continued on page 104)

coded form; thus, you cannot easily modify these files directly. In Proofreader's present form, new words must be added manually in ASCII form using Scripsit, Pencil, or whatever, to the ASCII dictionary module called AUXDICT/TXT. This ASCII file is the only dictionary module accessible to you for the purpose of making changes or corrections.

With this brief introduction in mind, let's walk through a typical proofreading session with Proofreader.

When PROOFRDR/CMD is activated, it asks for the name of the ASCII text file to be checked. It then proceeds to gather all unique words (not necessarily misspelled or unknown words) into computer memory for subsequent comparison against the three dictionaries.

A unique word is one used one or more times throughout the text. For example, the word "the" is used numerous times in a text file, but it is stored by Proofreader in memory only once as a unique word. There would be no sense in checking "the" for correct spelling each time it is encountered in the text file. Bear in mind, however, that the typo "teh", with the letters e and h inverted, is a "unique" word which is not in the system's dictionary. The user will, of course, recognize the misspelling when Proofreader flags it as such.

After Proofreader has read through the entire file, a count of unique words will be presented on the video monitor. It is interesting to note that, according to Proofreader's documentation, seldom does the number of unique words in a long document exceed 800. In my initial trials with Proofreader, I have yet to go much over 600 unique words.

Proofreader then proceeds to match the unique words in memory with its vocabulary in the three dictionaries. Misspelled or unknown words are displayed collectively on the video monitor and, at the user's option, can be written to a separate ASCII text file on diskette (this ASCII file is not yet a dictionary file) created by the operator. I recommend that this alien word file be saved to disk for two reasons: it provides the means to later dump the alien words to a printer by way of Scripsit or Pencil, and it can subsequently be used to add to Proofreader's ASCII AUXDICT/TXT file for expanding Proofreader's vocabulary.

The entire proofreading process

can take from about 3½ minutes to four or five minutes, depending on document length. If the TRS-80 has a souped-up CPU (e.g., the Archbold Speedup Board), the proofreading time will be less. For my 4.0 MHz TRS-80, two minutes or less is about normal.

The advantage of Proofreader over Hexspell is that you can get up and raid the refrigerator while proofreading is being done automatically. But upon completion of proofreading, Proofreader by itself falls behind Hexspell in convenience and usability. Unlike Hexspell, which updates its binary dictionaries automatically when commanded by the operator, Proofreader requires the manual merging of the ASCII alien word file, created by you, with its AUXDICT/TXT file. This procedure requires loading AUXDICT/TXT into the system with either Scripsit or Pencil, followed by either chain-loading the disk alien word file or manually typing in each of the alien words.

I should mention that Aspen Software is also working on a new word processor that sounds very enticing. The most interesting features are unlimited file size, which would be great for very long documents or books, and a text formatter which will support underlines, subscripts, superscripts, boldfacing or overstriking, proportional spacing for capable printers, and the ability to generate continuous form letters from a file of names, addresses, etc.

Technical considerations. Proofreader works perfectly with TRSDOS, NEWDOS-2.1, NEWDOS-80 and LDOS, in both single and double density. Again, I presume, but cannot verify, that it will work with the other TRS-80 Model I disk operating systems.

Proofreader works with any TRS-80 word processor. There are no problems with Scripsit as upgraded by Superscript, and there appear to be no incompatibilities deriving from program code patches, either commercial or user-originated, as installed into the various word processors' machine code.

Microproof

Cornucopia Software, PO Box 5028, Walnut Creek, CA 94596.

Microproof is available as a so-called standard system for $69.50. An extra $60 obtains a correcting module which, similar to Proofreader's Proof-Edit, automatically corrects the source file. Another $35 obtains a third module, for either Scripsit or Pencil, which allows you to do all proofreading and correcting operations from within the word processor program without a requirement to return to DOS. This third module is not required for Lazy Writer.

All TRSDOS-related disk operating systems, including NEWDOS-80 V1 and V2, are supported. Although the prices are slightly steeper than Hexspell or Proofreader, you should expect to pay more for a Cadillac system.

Microproof is also available for the Apple.

As was the case for Proofreader, Microproof can also function with only 32K of RAM and a single disk drive.

Let's start with an examination of Cornucopia's $69.50 standard Microproof features. The main working file is called MICPROOF/CMD and is called up from DOS. MICPROOF/CMD then asks for the name of the ASCII text file to be proofed and proceeds to check it for alien words. Misspelled or unknown words are displayed collectively on the screen, or they can optionally be dumped to a printer. If the operator so chooses, the alien words can subsequently be displayed in context; that is, they are displayed as they appear within the text file being proofed. Corrections to the text file must then be performed by the operator using the global search and re-

↙ See List of Advertisers on page 146

(continued from page 102)

ignore or modify the errors or style blunders flagged by Grammatik. And, obviously, not every style or punctuation error is detectable by computer programs of this type. Nevertheless, Grammatik provides the means for developing substantially improved quality in manuscripts and letters.

Electric Webster

Electric Webster is from Cornucopia Software. The price for the standard Electric Webster is $89.50; for the grammar checker option (similar to Grammatik) $35; and for the automatic hyphenation option $35. You can upgrade from standard Microproof to standard Electric Webster for $35.

The new Electric Webster's primary claim to fame is the implementation of a 50,000 word literal dictionary as opposed to the symbolic dictionary employed by Microproof. A symbolic software dictionary is constructed (programmed) with root words, and from these root words the software is able to process derivative words by applying standard prefixes and suffixes. In contrast, a literal dictionary never assembles words from root words—for a word to be accepted it must be spelled exactly as it is stored in the literal dictionary.

As an example, the word "inclosed" is not the standard spelling in the United States, but it might pass the software's proofing process as a result of "in-" being an acceptable prefix for the acceptable word "closed" or "close." A literal dictionary does not allow for such programmed decision making. The word "enclosed" must be in the literal dictionary to pass, and the absence of the word "inclosed" causes it to be flagged as an unknown or misspelled word. Although a literal dictionary will require more diskette space than a symbolic dictionary, the widespread use of double-density disk systems makes this a minor problem. In addition, binary-coded dictionaries are retained by Electric Webster which reduced its demand for physical diskette storage space.

It might appear that a literal dictionary might slow down the proofing process as a consequence of the software having to plow through a larger number of unique words. Actually, Electric Webster is faster than its predecessor (Microproof) because it performs random access in searching through the dictionaries.

Other significant improvements in Electric Webster include: word count statistics (how many times a word is used, plus total word count); dictionary words can be called to the screen for reference purposes (a user's text words can be compared to variations in the software dictionary); and spelling corrections are immediately verified against the dictionary before being accepted by the system.

At this time I have no information or details on either the grammar checking or automatic hyphenating features, but if they measure up to the quality of Microproof and Electric Webster, they should be something to look forward to.□A.D.

place commands of the word processor program (Scripsit, Pencil, Lazy Writer, etc.). So far, the operation is very similar to Proofreader as described above.

There are, however, some subtle but important differences. For one, Microproof contains a considerably larger, 50,000 word, binary-coded dictionary, thus confronting the operator with far fewer alien words to manipulate. To make the dictionary proofing operation even more efficient, Microproof recognizes nouns, verbs, adjectives and adverbs, and, as a consequence, recognizes acceptable word prefixes, suffixes and derivatives, such as singulars and plurals, past and present tense and so on.

Furthermore, Microproof recognizes the validity of hyphenated words. The overall result is greater efficiency; the operator will be confronted with far fewer unrecognized words and considerably faster proofing.

Still working as a standard system, Microproof allows expansion of its binary dictionary files in a unique way. Use your word processor to create a disk file containing a list of words—each word can be identified as a noun, verb, adjective or adverb or any combination of these. Then use the Microproof module named ADDTODIC/CMD (add to dictionary) to convert your ASCII list into binary form, which is then written to the Microproof binary dictionary.

It's not quite as convenient as automatic dictionary expansion, but at least there is no need to work with a separate, and slower, ASCII dictionary.

Assuming that your long-awaited pay raise just came through, go now and purchase the $60 Correction Feature module. This module upgrades Microproof from the standard Microproof to the correcting Microproof, and the extra utility gained by this module is substantial.

Proofreading a document with correcting Microproof begins in the same manner as with standard Microproof. Call up MICPROOF/CMD from DOS and reply to the prompt with the ASCII document's filespec. Now sit back and just let things happen. MICPROOF/CMD will load and process the document as before, displaying all alien words collectively on the screen or printer.

When this proofing stage of operation is completed, a working file called CORRECT/CMD (the one just purchased for $60) is automatically invoked and sets up a prompting display for operator input. Each alien word is displayed, one at a time, and the operator is asked to choose:

1) Correct or change the alien word
2) Skip over the alien word
3) Add the word to the dictionary
4) Display the word in context
5) Exit to DOS

When adding a word to the dictionary, you can code it as a verb. noun, adjective or adverb. I strongly recommend inclusion of these simple codes because to neglect them obviates one of the most significant features of Microproof. As I stated above, by providing such codes Microproof will be able to recognize word derivatives such as singulars and plurals, past vs present tense, and so on. For those who don't know a noun from an adverb, either use that dusty old dictionary to find out or bypass the coding option.

After you've processed all alien words, they are automatically added to the binary dictionary (no need for an interim creation of separate ASCII

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files, although the capability is still available), a corrected text file named CORRECT/TXT is created by Microproof (the original text file is left intact), Scripsit is automatically uploaded, and the corrected document is automatically loaded by Scripsit. To summarize, all you need to do is load disks and files when so prompted and tell Microproof what to do with each *alien* word. The rest is automatic.

The third option, called SPATCH/CMD ($35) patches some machine code into their Scripsit or Pencil (specify Scripsit, Scripsit with Superscript, or Pencil when ordering), which permits you to command the entire proofreading and correcting process without ever leaving the word processor program; that is, you don't need to start from or return to DOS to do the proofing.

This third option completes the Microproof system and provides for a fast, complete and easy to use supplement to any word processing application. The complete Microproof system is, by far, the most capable and efficient of these spelling checker programs.

The complete Microproof system is, by far, the most capable and efficient of these spelling checker programs.

To purchasers of the full Microproof package, an additional, and important, program module, called PRINTDIC/CMD, which allows access to the operator-updated, binary-coded dictionary file, is provided. This module converts the operator-updated dictionary file from binary to ASCII. Once converted, the ASCII dictionary file can be loaded, examined, modified, corrected or supplemented, by way of the word processor. Upon completion of the changes, ADDTODIC/CMD (included with the standard Microproof) is used to convert the modified ASCII dictionary back to its binary-coded form for faster program execution. I would not be caught without this feature, because I've already managed to accidently insert a misspelled word or two into the dictionary. Without PRINTDIC/CMD, there is no easy way to remove the offending word.

For those of you who will be using Scripsit with NEWDOS, don't forget to install the NEWDOS-80 ZAP 003 for proper disk operation, if not already done (see NEWDOS-80 zaps in its documentation).

To properly construct a virgin copy of Scripsit/LC with both Superscript (by Acorn) and SPATCH/CMD (Microproof) options, I find the following procedure to work reliably. As usual, perform all Scripsit/LC modifications on a backup copy.

1. Follow the Superscript instructions to modify a virgin copy of Scripsit/LC. The end product will be a modified version of Scripsit/LC, renamed automatically as Script/CMD. Leave the name Script/CMD unchanged. If Superscript is not used, skip this step.

2. Using any TRS-80 DOS, use either Microproof's SPATCH/CMD for a virgin Scripsit or the SUPPATCH/CMD for the Superscript version of Scripsit, to patch the word processor. Follow the instructions provided in the Microproof documentation.

3. If you'll be using NEWDOS as your exclusive disk operating system, install NEWDOS-80 ZAP 003 as shown in the NEWDOS-80 documentation. Note that ZAP 003 contains five sets of zaps. Omit the fourth zap, which goes to sector 00, relative byte 63 (00/63). This code change has already been installed in somewhat different form by SPATCH/CMD or SUPPATCH/CMD. (This set of zaps fixes SCRIPSIT/LC so that it will respect the high memory protection area as defined in memory location 4049 hex. If this is not clear to the reader, ignore any technical explanation. Just follow the guidance provided.)

For LDOS users, the Scripsit/fix file provided with that system to modify Scripsit is fully supported by Microproof.

Technical considerations. Microproof works perfectly with any TRS-DOS-related disk operating system in either single- or double-density. It is also important to note that the Microproof author offers to maintain full compatibility with any TRS-80 TRSDOS-related DOS or TRS-80 word processor. If in doubt about your TRS-80 system, call before ordering.

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Chextext

Apparat, Inc. 4401 So. Tamarac Parkway, Denver, CO 80237. $59.95.

The Chextext package requires a minimum system configuration of 32K and two disk drives. Note that the correct price of $59.95 shown above differs from the $79.95 price quoted in earlier Chextext ads.

In a manner similar to Proofreader, Chextext makes a pass through the document to be proofed and builds a list of unique words. It then proceeds to check this list against its dictionary for misspelled or unknown words. This mode of operation is somewhat slower when compared to the other three programs being analyzed herein, and this is, no doubt, a consequence of Apparat's use of an ASCII dictionary. Also, the relatively small size of Apparat's dictionary—15,000 words—results in a substantially larger list of alien words that must be manipulated by the operator.

> The use of an ASCII dictionary by Chextext has both advantages and disadvantages.

When words are added to the dictionary by the second choice above, they are stored in a separate buffer on the dictionary diskette. Although these newly added words are always available to Chextext as part of the dictionary during subsequent proofing sessions, they are not yet stored in alphabetical order. Whenever so motivated, the operator simply uses the Chextext Reorder command, which will alphabetize the new words into the dictionary.

The use of an ASCII dictionary by Chextext has both advantages and disadvantages. On the plus side the operator has total access to the dictionary; thus, the operator can verify the integrity of the dictionary at any time, and changes or corrections can easily be made. On the minus side, Chextext's use of an ASCII dictionary, besides making for a somewhat slower proofing process, also results in rather sizable demands for disk space. Compare, for example, Chextext's 15,000 word dictionary, which occupies about 65 grans on a diskette, with Microproof's 50,000 word binary-coded dictionary, which occupies 55 grans.

This does not mean, however, that the size of the available Chextext dictionary is necessarily limited. Depending on the disk track count, use of double-sided diskettes, or availability of double-density diskettes, correspondingly larger dictionaries can be created. Also, Apparat offers larger dictionaries, precreated for the operator, at no cost, although there is a nominal charge of $3 for the diskette. Details are provided in the Chextext documentation.

To make corrections to the proofed document, each alien word, if so commanded by the operator, is marked with a pound (#) sign over the last letter of the word. Note that the original text file being checked will be overwritten with a new file containing the # signs. As usual, there is the very real danger of clobbering the original text file during this process, so keep a backup.

To make changes or corrections to the proofed document, you must load the word processor, followed by a load of the flagged document file. Then, using the word processor's find and/or replace command, each # sign is used as a key to find and/or correct each alien word. The # sign makes it relatively easy to locate the alien words, and the word processor's global change feature can be used to make changes or corrections quickly.

An Apparat spokesman informs me that an upgrade to Chextext is in the works, planned for release sometime later this year. The upgrade will include automatic document correction, a compressed dictionary with user access, plus a few surprises. Estimated cost to current owners of Chextext will be nominal (current estimate is $20).

Technical considerations. Similar to Microproof, but at no extra charge, Chextext comes equipped with a program called Modify/CMD, which modifies an original copy of Scripsit so that the proofreading process can be commanded from within the word processor. If this modified Scripsit—or any Scripsit, for that matter—is intended for use with NEWDOS, zap 003 as provided in the NEWDOS-80 documentation must be used.

As an alternative to patching Scripsit, or if other word processors such as Pencil or Lazy Writer are to be used, Chextext can be commanded from DOS independently of the word processor. Also, for the Superscript version of Scripsit, Modify/CMD is not compatible, and you must command Chextext from DOS rather than from within the word processor.

Conclusions

That wraps up my impressions of the four TRS-80 Model I spelling dictionary programs. I've tried to be as objective as possible and to anticipate questions most likely to be asked by potential buyers. Each of the four packages offers different capabilities and different levels of convenience, and these variations are clearly reflected in the price differences.■

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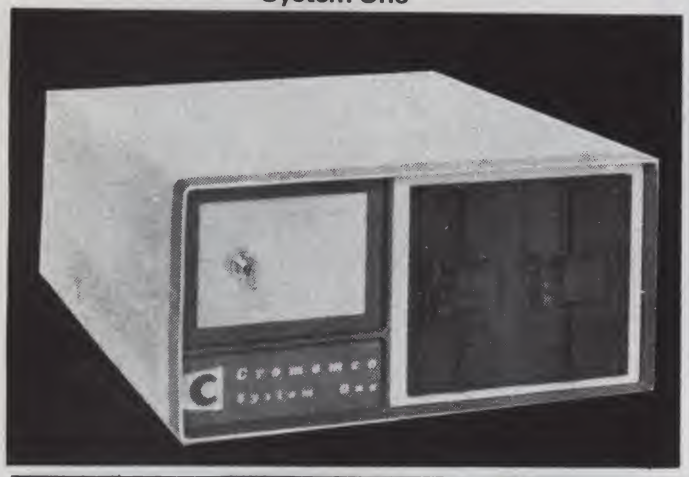

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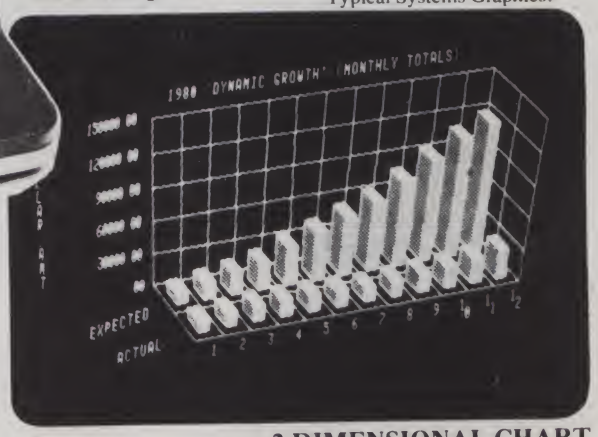

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Put a Celestial Navigator In Your Pocket

With the stars, and the TRS-80 Pocket Computer, to guide you, you can astronavigate the seven seas.

By George R. Zucconi

Now that you can take your computer with you, let it show you the way.

Using your TRS-80 Pocket Computer, a sextant and the stars, you can astronavigate the seven seas. Making the calculations which convert a sextant observation to the position of a ship is fraught with pitfalls for even an experienced navigator. The computer will eliminate most of the errors that cause navigators to jump out of their bunks in a cold sweat to rework calculations for the third time.

The computer can lead you through a tangled maze of calculations. It will remember for you the quickly-forgotten rules of what to do with angles over 360 degrees, and the quirks of sexagesimal addition and subtraction. It will also take up far less room than the six volumes of H.O.229, or even the three volumes of the abbreviated H.O.249 sight reduction tables, usually used to solve the spherical trigonometry equations involved.

You don't need to know what sexagesimal means, and you don't even need to use high-school mathematics. However, you do need the *Nautical Almanac* for the current year, and you should know how to extract the data from this informative volume. It's available from the Government Printing Office for less than $10, or you may find it locally at a boat supply store if you live near the seacoast.

You don't need to know what sexagesimal means, and you don't even need high-school mathematics.

If you don't know how to use the *Nautical Almanac*, numerous publications explain the tables in detail. Check your library's index of books on celestial navigation as a start. One of the best books I've come across is *Primer of Navigation*, by George W. Mixter (Van Nostrand Reinhold Co., 1979). It is an easy-to-understand volume covering all phases of navigation, simple enough for the beginner and thorough enough for the advanced navigator. Another unique book which also goes into positional astronomy a good deal is aptly titled *Positional Astronomy and Astronavigation Made Easy*, by H.R. Mills (John Wiley & Sons, 1978).

Sextants for measuring a celestial body's altitude above the horizon are precise optical and mechanical instruments. Some are works of art in brass and are lovely to behold. If you can afford one I envy you. I use one made of plastic by Davis Instruments of San Leandro, CA, that I bought new for less than $30. It's accurate to within two minutes of arc and suffices. For you tinkerers, Mills' book gives detailed information on how to construct one from simple materials.

How to Use the Program

After loading the program, type in RUN and press the enter key. The title ASTRONAVIGATION will be displayed for about one second, and then will be replaced by the display LATITUDE(+N/−S)=. The estimated position of the ship or dead reckoning for latitude is typed in here. If the latitude is north of the equator its sign is plus, but the (+) sign does not have to be entered. If the latitude is south of the equator the degree value must be preceded by a (−) sign. All entries are made into the computer with degree readings. The display window must show the angular symbol set to DEG.

Degrees are entered as whole numbers, and minutes are entered after a decimal point. For example, if the latitude is 34 degrees, 45 minutes north, you would enter 34.45 after the equal sign in the display LATITUDE (+N/−S)=. Check all numbers and

Address correspondence to George R. Zucconi, 6106 Wenrich Drive, San Diego, CA 92120.

the sign before pressing the enter key. If you have typed the wrong number or forgotten the minus sign (if it was a southern latitude) press the clear key and then type in the correct data.

You may do this as many times as necessary to get it right, as long as you have not pressed the enter key. Once the enter key is pressed the data is in memory and can't be changed, except by pressing the break key and running the program again. If this is done each data item must be entered anew for the second run.

Assuming there is no human error up to this point, pressing the enter key will elicit the next data item you must input. The display will read LONGITUDE(+E/−W)=. Type in the degrees and minutes of longitude. No sign is necessary if longitude is east. A (−) sign must be typed in before the degrees and minutes if longitude is west.

Altitude and Corrections

Press enter and the display will show HS=. Enter the height or degree reading obtained by your sextant observation. HS is a symbol for sextant height.

Next is I.C.=. This is the index correction for the sextant. Enter plus or minus according to which way the reading varies from zero. If the correction is zero, then enter zero.

DIP CORR.= is the correction for dip or height of observer's eye above the horizon. It is always a negative correction, so it must be preceded by a minus sign.

The next display will print out a value for the apparent height of the observed body, HA=00.0000 DMS. The digits to the left of the decimal are the degree reading. The first two digits to the right of the decimal are the minutes, and the last two digits to the right of the decimal are the seconds. The symbol DMS indicates that the displayed value is in degrees, minutes and seconds.

All data is entered as degrees, minutes and seconds. The program automatically converts this to decimal degrees for calculation, and converts it back to degrees, minutes and seconds for display. When the display is more appropriate or convenient in decimal degrees, the display will show the symbol D.DEG.

HA is the sextant height corrected for dip and index error. It is used to determine the main correction, or altitude correction for refraction, which is the next correction needed. Before pressing enter, note HA and look up the altitude correction in the *Nautical Almanac*. After pressing enter the display will ask for ALT. CORR.=. Enter the altitude or main correction here.

The next three items of data called for are special corrections needed only if the observed body is the Moon, Venus or Mars. If none of these was used for the sextant sight, enter zero for each of these displays.

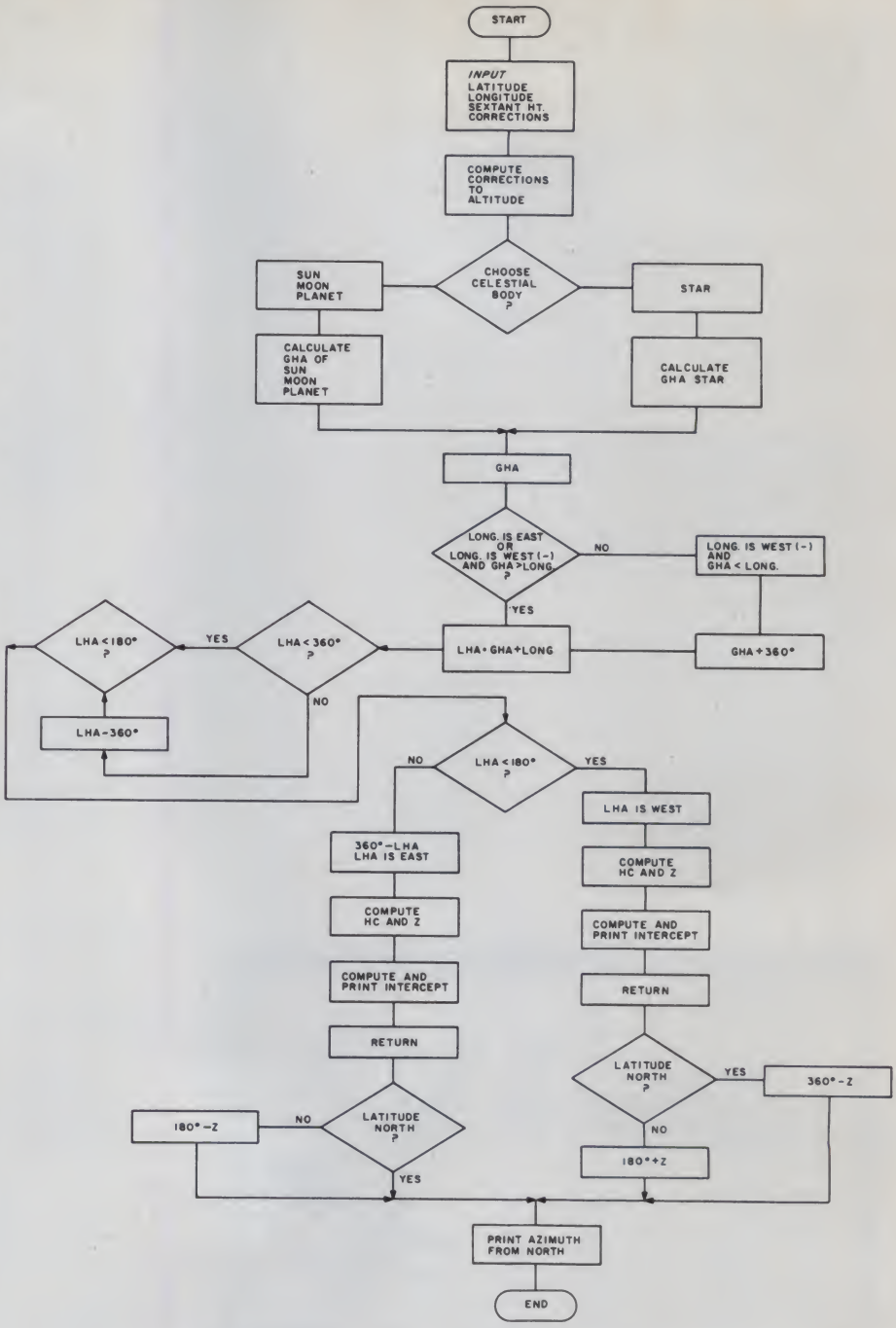

Fig. 1. Logic diagram.

H.P. Moon=. Enter the horizontal parallax correction for a Moon observation. This is obtained from the *Nautical Almanac*.

Moon U.L.(−.30)=. If the upper limb of the Moon was used enter a correction of −.30 as noted in the parentheses.

VENUS/MARS=. This is a special correction necessary if one of these planets was used for a sight. It is obtained from the *Nautical Almanac*.

The next display gives the observed height, HO. This is the height or alti-

tude of the observed body after all the previous corrections have been added and subtracted. It is displayed in DMS. You do not need to remember the value. It will be retained in the computer memory to be used in a later calculation. It is shown only to demonstrate the difference between the altitude as read from the sextant and the actual altitude of the observed body.

If you were doing this with pencil and paper you would have had to add and subtract five or six different values for degrees, minutes and seconds, and you would have been introduced to sexagesimal addition and subtraction. Addition and subtraction of numbers to the base 60 is best left to those who can take comfort in their mathematical skill when they find themselves one mile off for every one minute of error.

The only mathematical effort needed on your part is to figure out how to convert tenths of a minute to seconds for entry into the computer. The *Nautical Almanac* prints its values like this—63° 55′.7. This means 63 degrees, 55 and seven-tenths minutes. You cannot enter 55′.7 into the computer because you have already used the decimal place to separate degrees and minutes.

With perhaps great reluctance on your part, but with not much effort, this is how it is done. Take that number after the decimal point, that 7, and multiply it by 6. That makes 42. Substitute that 42 for the 7, and enter the whole value like this: 63.5542. The rule is to multiply the tenths of minutes by 6 to obtain the number of seconds.

Here is another example. The *Nautical Almanac* gives the value 228° 13′.3. You enter into the computer 228.1318. That's the only mathematics you need to apply for the entire run.

Greenwich Hour Angle

The computer will next ask you a question: IS BODY A STAR? Y/N. If you answer yes by pressing the Y key and then the enter key, it will tell you how to give it information so that it can compute the Greenwich hour angle of the star.

It will ask for GHA ARIES=, the Greenwich hour angle of Aries; CORR. FOR M/S=, the correction to apply for obtaining the value to the nearest minute and second; SHA STAR=, the sidereal hour angle of the star; and DECLINATION (+N/−S)=, the declination of the star. All these values are taken directly from the pages of the *Nautical Almanac* without any interpolation necessary on your part except the simple multiplication of a single digit by the number 6 as noted above.

After entering these values, the display window will be blank for a few seconds. The computer's circuits are busy figuring out a deceptively simple-looking, yet one of the most devilishly tricky, computations of the whole bunch, the meridian angle. This sometimes is known as the angle t. It is also called the local hour angle, and is displayed by the computer as LHA 000.0000 DMS E. or W.

The local hour angle is the angle between the celestial body and the local north-south meridian at the time of observation. It is measured from north to 180 degrees east or west. It is a critical factor in determining position, and errors in its calculation are usually whoppers. Here again angles have to be added and subtracted, but

difficulties arise because the final angle has to be reduced to less than 180 degrees. The arithmetic can result in angles of negative value to those totaling more than 360 degrees.

There are fussy rules to reduce the angle to less than 180 degrees, and to convert negative values to positive, but these are easily forgotten. Conversion also changes direction from west to east and is another pitfall to cope with. All the rules are in the computer's memory, and will be applied automatically. The display will give you the angle in values less than 180 degrees, and it will indicate whether direction is east or west.

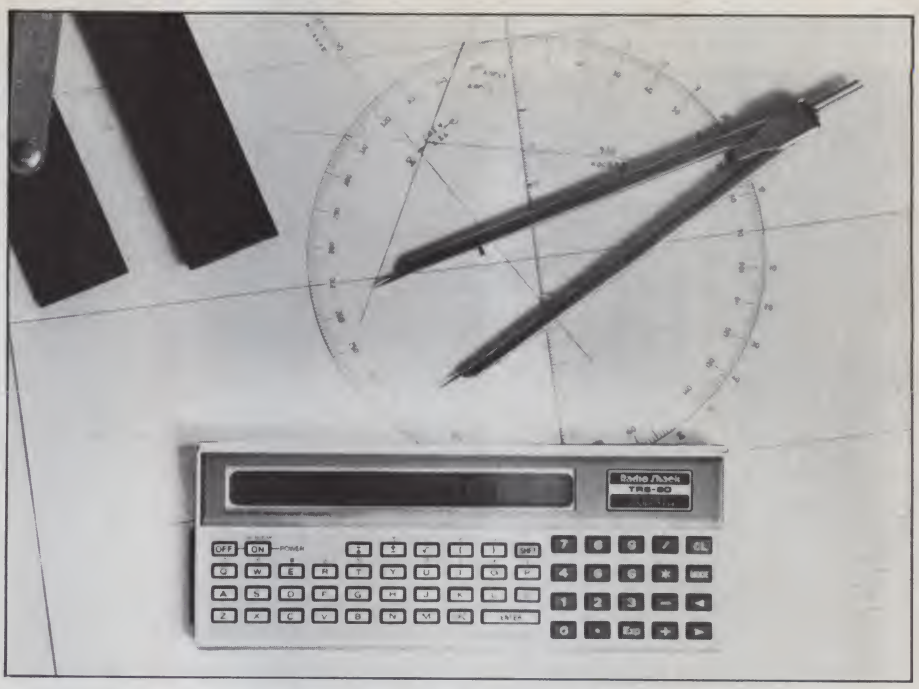

Photo 1. The tools for astronavigation including the TRS-80 Pocket Computer.

Finding Hc and Z

After display of the value for LHA the computer goes into the serious business of solving the astronomical triangle for the computed height of the astronomical body and its azimuth. Very formidable-looking equations in spherical trigonometry are used for these solutions. They are so awesome that no one works them out with pencil and paper or slide rule. The previously-mentioned sight reduction tables are lists of solutions for these equations worked out for all possible combinations of latitude, declination and hour angle to the nearest whole degree. Further tables and interpolation are necessary for closer approximation.

Entries in these tables must number well over a million. In all honesty,

↙See List of Advertisers on page 146

they are not very difficult to use, but are just more steps to stumble over. The computer takes about five seconds to grind through these, less time than it takes to find the right page in the six volume set of tables.

When the display blinks on again, it will read INT. (+T/−A) 00.0 MIN. This is the intercept used to plot the line of position. After calculating the height of the astronomical body, the computer compares it to the observed height and calculates the difference. This difference, in minutes of angle, is the distance, in nautical miles, from your dead reckoning position to your actual position. A positive value (+T) indicates that the position is towards the observed body. A negative value (−A) indicates that the position is away from the observed body.

One more piece of information is necessary before you can plot the line of position. You must know the bearing of the body at the time of the observation. Pressing the enter key after display of the intercept will give the bearing. The display will now show Z= 000.0 D.DEG. Z is the symbol for azimuth or compass bearing. It is measured from north to 180 degrees east or west. If you are in a north latitude and the LHA is east, Z indicates the bearing is north 000.0 decimal degrees east. If latitude is north and LHA is west, then Z indicates the bearing is north 000.0 decimal degrees west. In the southern hemisphere things are turned around and bearings are indicated from south instead of north.

To avoid confusion over bearings from north or south, another method of compass direction is available. You can get this by pressing the enter key one more time. The display reads ZN=000.0 D.DEG. ZN is the symbol for azimuth from north. It is the compass bearing through 360 degrees from north. The computer remembers your latitude, and the direction of the astronomical body, and automatically computes ZN.

There you have it! The values for intercept and azimuth are all you need to plot a line of position. Two lines of position are needed to cross and fix the position at a point, but all the hard work is done by the computer. The only need for pencil and paper is to draw the line of position on the plotting sheet.

Greenwich Hour Angle For Sun, Moon and Planets

One more point. Remember the question earlier, IS BODY A STAR? Y/N? It was answered "yes." You would answer "no" if your sextant sight was taken from the Sun, the Moon or one of the planets.

Answering "no" instructs the computer to prompt you for the information it needs to calculate the Greenwich hour angle of one of these bodies. This is somewhat different than the data needed for a star.

The first display after answering "no" will be GHA SUN/MOON/PLAN.=. Enter the GHA for one of these bodies. Next, enter the corrections for minutes and seconds after CORR. FOR M/S=. If the sight was

```
 10:"NAV":PAUSE"  ASTRONAVIGATION"
 20:INPUT" LATITUDE(+N/-S)=";T
 30:T=DEG T
 40:INPUT" LONGITUDE(+E/-W)=";O
 50:O=DEG O
 60:INPUT" HS=";H
 70:H=DEG H
 80:INPUT" I.C.=";I
 90:I=DEG I
100:INPUT" DIP CORR.=";D
110:D=DEG D
120:H=H+I+D
130:H=DMS H
140:USING"####.####"
150:PRINT" HA=";H;" DMS"
160:H=DEG H
170:INPUT" ALT. CORR.=";A
180:A=DEG A
190:INPUT" H.P.MOON=";P
200:P=DEG P
210:INPUT" MOON U.L.(-.30)=";U
220:U=DEG U
230:INPUT" VENUS/MARS=";V
240:V=DEG V
250:H=H+A+P+U+V
260:H=DMS H
270:PRINT" HO=";H;" DMS"
280:H=DEG H
290:Y=1
300:INPUT" IS BODY A STAR? Y/N";B
310:IF B=1 THEN 450
320:INPUT"GHA SUN/MOON/PLAN.=";C
330:C=DEG C
340:INPUT" CORR. FOR M/S=";E
350:E=DEG E
360:INPUT" V CORR.MOON/PLAN.=";F
370:F=DEG F
380:INPUT" DECLINATION(+N/-S)=";J
390"J=DEG J
400:INPUT" CORR. FOR M/S=";K
410:K=DEG K
420:L=J+K
430:G=C+E+F
440:GO TO 540
450:INPUT" GHA ARIES=";C
460:C=DEG C
470:INPUT" CORR. FOR M/S=";E
480:E=DEG E
490:INPUT" SHA STAR=";F
500:F=DEG F
510:INPUT" DECLINATION(+N/-S)=";L
520:L=DEG L
530:GO TO 430
540:IF (SGN O>Ø)+(G>ABS O) THEN 560
550:G=G+360
560:Q=G+O
570:IF Q<360 THEN 590
580:Q=Q-360
590:IF Q<180 THEN 670
600:Q=360-Q
630:Q=DMS Q
640:PRINT" LHA=";Q;" DMS E."
650:Q=DEG Q
660:GOSUB 900
665:GO TO 710
670:Q=DMS Q
680:PRINT" LHA=";Q;" DMS W."
690:Q=DEG Q
700:GOSUB 900
705:GO TO 740
710:IF SGN T>Ø THEN 780
720:Z=180-Z
730:GO TO 780
740:IF SGN T>Ø THEN 770
750:Z=180+Z
760:GO TO 780
770:Z=360-Z
780:PRINT" ZN=";Z;" D.DEG"
790:END
800:CHAIN"900"
900:R=ASN (SIN T*SIN L+COS T*COS L*COS Q)
910:S=H-R
920:S=DMS S
925:S=S*100
926:USING
927:USING"####.#"
930:PRINT" INT.(+T/-A)=";S;" MIN"
940:Z=ATN ((SIN Q/(COS T*TAN L-SIN T*COS Q))
950:IF SGN Z>Ø THEN 990
960:Z=Z+180
990:PRINT" Z=";Z;" D.DEG"
995:RETURN
```

Program listing. Astronavigation program for the TRS-80 Pocket Computer.

taken of the Moon or one of the planets, a special v correction should be entered next to the display V CORR MOON/PLAN. = . Enter zero if the Moon or one of the planets was not used.

The next display, DECLINATION (+ N/ – S), prompts you to input the declination of the body. The (+ N/ – S) symbol reminds you that this value should be minus or negative if declination is south. CORR.FOR M/S = is the correction of the declination for minutes and seconds. The program will then go on to compute the LHA as outlined previously.

INPUT	DISPLAY
LATITUDE(+ N/ – S) = 34 45	
LONGITUDE(+ E/ - W) = – 47 50	
HS = 65.1130	
I.C. = .03	
DIP CORR. = – .0518	
	HA = 65.0912 DMS
ALT.CORR. = – .0024	
H.P.MOON = 0	
MOON U.L.(– .30) = 0	
VENUS/MARS = 0	
	HO = 65.0847 DMS
IS BODY A STAR? Y/N Y	
GHA ARIES = 24.5212	
CORR. FOR M/S = 2.5730	
SHA STAR = 49.5524	
DECLINATION(+ N/ – S) = 45.0924	
	LHA = 29.5505 DMS W.
	INT (+ T/ – A) = 8.3 MIN
	Z = 56.3 D.DEG
	ZN = 303.6 D.DEG

Solving the sample problem.

Conclusion

The main advantages of the computer over traditional methods, and even calculator methods, are speed and accuracy. By far, the most important is accuracy. Each variable has to be looked up in the *Nautical Almanac* only once. You do not need to write it down and then insert it into the proper equation at a later step. You don't have to remember the different methods of calculating GHA for the Sun, Moon, planets or stars. You need not have the nagging fear that you forgot some special correction or inserted it into the wrong place. The computer asks for all the data necessary for each calculation, and it makes no errors in arithmetic or procedure.■

Sample Problem

Due east of Cape Hatteras. July 2, 1966, about morning twilight, Dead Reckoning 34° 45′ N, 47° 50′ W, observed star Deneb, Hs 65° 11′.5 at GMT 07h 11m 48s, index corr. +3.0, ht. eye 30 ft.

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Atari Gets Serious

Learn how a "game computer" such as the Atari can be used in a physics lab.

By Ted McFadden

Most people are aware that Atari computers can play quite a game of Star Raiders, but how many realize that they are also powerful educational tools?

I discovered the educational aspects of my machine shortly after I bought it. We had been working on simple harmonic motion (the oscillatory motion produced, for example, by a spring) in physics. The teacher was demonstrating what is called a Lissajous curve (see Fig. 1). The demonstration was impressive, but lacked the precision and control I felt a computer, like my Atari, could provide.

Needless to say, as soon as I got home I programmed my 800 to plot Lissajous curves. (I had just eliminated the need to have a scope and frequency generators to experiment with Lissajous curves. This machine was opening doors for me!) The program was a success. I could plot the curves and observe the effects of changing various parameters. That was a key point—I got to play with a concept (in this case Lissajous curves) until I could command it, and I will not soon forget what I learned through my computer.

The curves the program was producing were visually pleasing so I added provisions to draw them at any screen position and size. This computer art was an unexpected bonus.

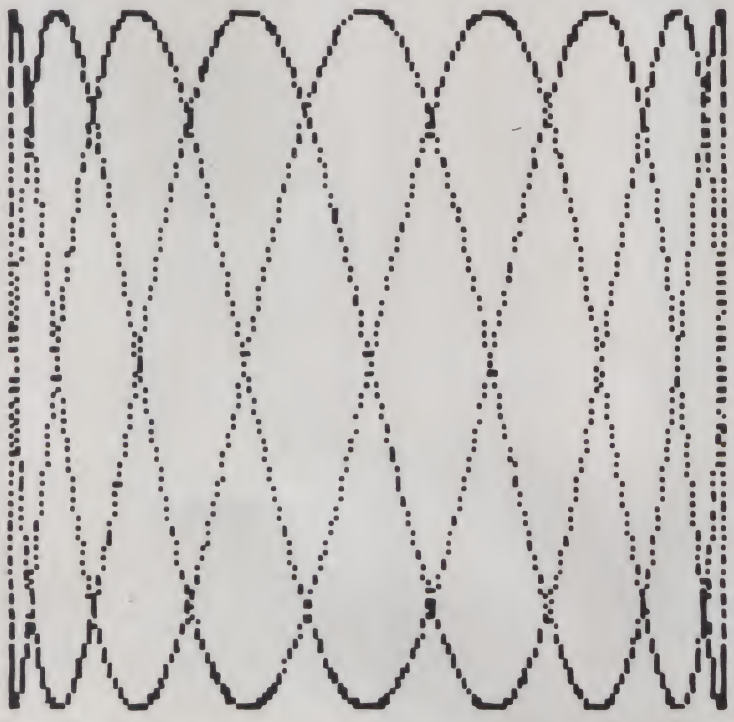


Fig. 1. Generating a Lissajous curve on the Atari.

Plotting a Lissajous Curve

Lissajous curves are plots of the motion of a particle that is being acted on by two perpendicular simple harmonic motions. (I suggest consulting a physics book for a more in-depth explanation.) Thus, the coordinates of a point on a Lissajous curve can be expressed as:

$$x = A_x \cos(w_x t + dx)$$
$$y = A_y \cos(w_y t + dy)$$

A is the amplitude, w the angular speed, d a phase constant and t the time. These parameters make sense, but the best way to get a feel for them is to play around with them. This is where the Atari comes in.

The Lissajous curve plotting program is shown in Listing 1. It should run on any 16K Atari 400/800. The following comments explain what each section of the program does.

Lines 1–30: Initializations. Line 30 darkens the background for better screen contrast.

Lines 40–50: Inputs the parameters of the motion that effects the x-coordinates of the Lissajous curve.

Lines 60–70: Inputs the parameters of the motion that effects the y-coordinates of the Lissajous curve.

Line 72: Inputs the screen center of the curve to be drawn.

Ted McFadden (4 Ames St., Cambridge, MA 02139) is a student at MIT.

Line 80: Inputs the dilation factor. If the scale would cause any out-of-bounds points, the program sets the scale to the maximum that will allow all the points to be plotted (lines 82–88).

Line 100: Input step. Step defines the smoothness of the plotted curve. The larger the step, the coarser the plot.

Line 120: Sets plot color.

Line 130: Plots the first point of the Lissajous curve (t=0) offset by the specified center point.

Line 140: Increases the time count by step.

Line 150: Draws a line to the next point on the curve.

Line 160: Keyboard check. If any key is hit the plot is halted. The space bar should be used. If not, the program will bomb later on.

Line 180: User is prompted. If answer is Y, the screen is cleared and new curve prompts are generated. If answer is "", then new curve prompts are generated (screen not cleared). Any other key stops the program.■

```
1   REM LISSAJ. PLOTTER BY TED MC FADDEN T.Q.R.
10  DEG:DIM A$(2)
20  GRAPHICS 8
30  SETCOLOR 2,0,0
40  PRINT"X:Amp,Omega,Phase";
50  INPUT AX,WX,PX
60   PRINT"Y:Amp,Omega,Phase";
70  INPUT AY,WY,PY
72  PRINT"Screen Center";: INPUT CX,CY
80  PRINT"Scale";: INPUT S
82  IF S*AX>CX THEN S=CX/AX
84  IF S*AX+CX>319 THEN S=(319-CX)/AX
86  IF S*AY>CY THEN S=CY/AY
88  IF S*AY+CY>159 THEN S=(159-CY)/AY
100 PRINT"Step";: INPUT T1
120 COLOR 1
130 PLOT S*AX*COS(PX)+CX,CY-S*AY*COS(PY)
140 T=T+T1
150 DRAWTO S*AX*COS(WX*T+PX)+CX,CY-S*AY*COS(WY*T+PY)
160 IF PEEK(764)=255 THEN 140
180 PRINT"READY.";: INPUT A$
190 IF A$="" THEN 40
200 IF A$(2,2)="Y" THEN 20
210 END
```

Listing 1. Lissajous curve plotting program for the 16K 400/800 Atari.

✓See List of Advertisers on page 146

Software Solution To a Hardware Headache

Troubled by unreadable text on your OSI Challenger I? Learn how to redefine your left and right margins with this program.

By Robert J. Murrell

```
30000 REM-SOFTWARE DEFINED MARGINS FOR C1P-R.MURRELL
30010 FOR X=1TO30:PRINT:NEXT
30020 INPUT"INDENT LEFT SIDE BY";LS
30030 IF LS<1 THEN LS=1
30040 IF LS>22 THEN LS=22
30050 INPUT"INDENT RIGHT SIDE BY";RS
30060 IF RS>22-LS THEN RS=22-LS
30070 PRINT:PRINT" WAIT":PRINT
30080 READ D$:IF D$<>"START" THEN 30080
30090 FOR M=546 TO 762:READ D$
30100 IF D$="END" THEN 30170
30110 REM- H TO D CONVERTER
30120 LH=ASC(D$)-48:IF LH>9 THEN LH=LH-7
30130 RH=ASC(RIGHT$(D$,1))-48:IF RH>9 THEN RH=RH-7
30140 D=LH*16+RH
30150 REM- END OF CONVERTER
30160 POKE M,D:NEXT
30170 POKE1,128:POKE2,2:POKE570,LS:POKE610,124-RS
30180 POKE11,128:POKE12,2:X=USR(X)
30190 DATASTART
30200 DATA48,8A,48,A9,20,8D,65,D3,8D,45,D3,68,AA,68,4C,BA,FF,8D,92,02
30210 DATA48,8A,48,A2,03,BD,65,D3,C9,5F,D0,02,A9,20,8D,65,D3,A9,65,CD
30220 DATA00,02,D0,13,A9,20,8D,65,D3,8D,45,D3,D8,18,AD,3A,02,6D,00,02
30230 DATA8D,00,02,A9,79,CD,00,02,D0,12,AA,AD,92,02,C9,0D,D0,02,A9,20
30240 DATA9D,00,D3,A9,7F,8D,00,02,68,AA,68,4C,69,FF,A2,04,BD,8D,02,9D
30250 DATA17,02,CA,D0,F7,4C,74,A2,22,02,33,02,00
30260 DATAEND
```

Listing 1. Basic solution to set Challenger 1 margins.

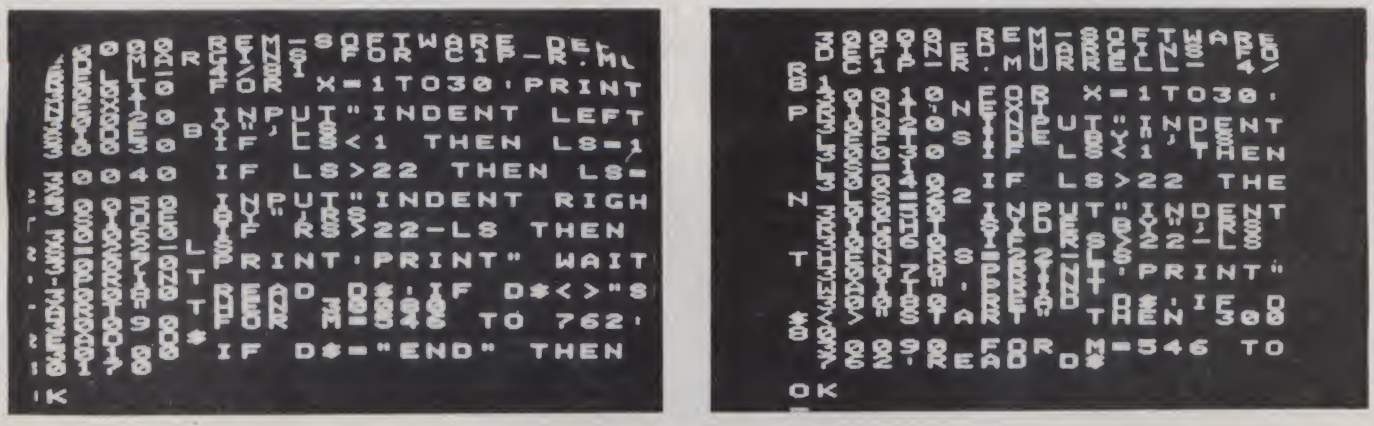
To decide whether this article is for you, answer the following. True or false:

- The text on your OSI C1P is too wide for the screen, making some of the letters unreadable.
- You don't enjoy converting your hexadecimal machine-language programs into decimal so they can be read into memory via data statements.
- The read statements of your utility program actually read the data statements of a coresident program.

If you answered "true" to any of these, read on.

When I first hooked up my C1P to a TV through an rf modulator, the left-most characters of some lines were off the screen. My first attempt at rectifying this problem was to respond to "TERMINAL

Address correspondence to Robert J. Murrell, 228 Springwood Drive, Verona, PA 15147.



The screen before and after modification.

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WIDTH?" with 20, thinking this would, of course, remove two characters from either side of the display. What a sinking feeling to find out that all four characters get removed from the right side of the screen, leaving the left side still unreadable.

Fiddling with the horizontal control, limiting terminal width to 23 and including a space in front of all print statements provided a workable solution for about a year. Then a hardware modification to a TV specifically set aside for use with the computer permanently solved the problem. Still, I couldn't help thinking of all those people without a technical background who were facing the same problem. The program presented in Listing 1 is the solution to this.

Lines 30020 through 30060 are used to input the number of spaces you want to indent the left side (LS) and the right side (RS). Lines 30090 through 30160 are a FOR-NEXT loop used to load the machine-language routine contained in the data statements. It is loaded into the unused memory starting at address 546 decimal. It's this machine-language program that keeps track of the cursor location and says whether you're allowed to print a character at this location, or if you must indent or do a carriage return. Finally, lines 30170 and 30180 change the value of certain addresses so that the machine-language program will be spliced into the input, output and warm start routines already in the computer (gene splicing on the computer level).

Now that the machine-language program is resident in page 2 memory, you don't really need the Basic program any longer, and the more than 900 bytes of memory consumed by the Basic program can be reclaimed by typing NEW (return).

Even when you use the monitor, warm start, load or save, the margins stay where you put them. If you've


```
0222  48          PHA             ;SAVE A AND X
0223  8A          TXA
0224  48          PHA
0225  A9 20       LDA  #$20       ;BLANK D365 AND D345
0227  8D 65 D3    STA  A$D365
022A  8D 45 D3    STA  A$D345
022D  68          PLA             ;PULL A AND X
022E  AA          TAX
022F  68          PLA
0230  4C BA FF    JMP  A$FFBA     ;JUMP TO INPUT ROUTINE
0233  8D 92 02    STA  A$0292     ;SAVE A AT 0290
0236  48          PHA             ;SAVE A AND X
0237  8A          TXA
0238  48          PHA
0239  A2 03       LDX  #$03       ;LS
023B  BD 65 D3    LDA  A$D365,X   ;SAVE FIRST CHARACTER ON LINE IF NOT CURSOR
023E  C9 5F       CMP  #$5F
0240  D0 02       BNE  TO 0244
0242  A9 20       LDA  #$20
0244  8D 65 D3    STA  A$D365
0247  A9 65       LDA  #$65       ;BRANCH TO 0261 IF CURSOR LOCATION<>D365
0249  CD 00 02    CMP  A$0200
024C  D0 13       BNE  TO 0261
024E  A9 20       LDA  #$20       ;BLANK D365 AND D345
0250  8D 65 D3    STA  A$D365
0253  8D 45 D3    STA  A$D345
0256  D8          CLD             ;ADD LS TO CURSOR LOCATION
0257  18          CLC
0258  AD 3A 02    LDA  A$023A
025B  6D 00 02    ADC  A$0200
025E  8D 00 02    STA  A$0200
0261  A9 79       LDA  #$79       ;RS
0263  CD 00 02    CMP  A$0200     ;BRANCH TO 027A IF CURSOR LOCATION<>RS
0266  D0 12       BNE  TO 027A
0268  AA          TAX             ;BRANCH TO 0270 IF (0290)<>0D
0269  AD 92 02    LDA  A$0292
026C  C9 0D       CMP  #$0D
026E  D0 02       BNE  TO 0272
0270  A9 20       LDA  #$20       ;LOAD A WITH BLANK CHARACTER
0272  9D 00 D3    STA  A$D300,X   ;WRITE FINAL CHARACTER ON LINE
0275  A9 7F       LDA  #$7F       ;SET CURSOR POINTER TO 7F
0277  8D 00 02    STA  A$0200
027A  68          PLA             ;PULL A AND X
027B  AA          TAX
027C  68          PLA
027D  4C 69 FF    JMP  A$FF69     ;JUMP TO OUTPUT ROUTINE
0280  A2 04       LDX  #$04       ;RELOAD POINTER LOCATIONS AFTER WARM START
0282  BD 8D 02    LDA  A$028D,X
0285  9D 17 02    STA  A$0217,X
0288  CA          DEX
0289  D0 F7       BNE  TO 0282
028B  4C 74 A2    JMP  A$A274     ;JUMP TO WARMSTART
028E  22                          ;DATA TABLE
028F  02
0290  33
0291  02
0292  00                          ;TEMPORARY STORAGE REGISTER
```

Listing 2. Margin modification program in machine language.

erased the Basic program and want to change the amount of indentation, just:

POKE 570, (LEFT SIDE): POKE 610, 124-(RIGHT SIDE) (RETURN).

If you break and cold start the machine it's easy to get the program working again:

POKE 1, 128: POKE 2, 2 (RETURN) (BREAK)W.

Listing 2 shows the machine language program for those who care to look into it.

Two items in the Basic program might be of interest to the Basic language user in general. First, the quickest and easiest method of loading a machine-language program on the C1P is to have a FOR-NEXT loop read data and poke them into their appropriate locations.

It irks me though to have to convert my hexadecimal machine-language listing into decimal data statements for the Basic program, just so it can reconvert them into hexadecimal and poke them into the desired addresses. Lines 30120 through 30140 let Basic have its cake and eat it too. You enter the data in the hexadecimal form you already have and the converter puts it into the necessary decimal form at the time the data is read. The converter does all the dirty work, albeit about four times slower than normal. In this particular case, this means about four seconds of running time vs one second of normal running time. In my opinion, the "wasted" three seconds are well spent.

> What about those people without a technical background facing the same problem?

Second, although I was satisfied with the program thus far, I found that it wouldn't run correctly with certain other programs already loaded into the computer. This wasn't the first time this had happened. The problem is demonstrated by the following example:

You have two or more programs loaded into your computer which use data statements and you wish to run the second program by itself. When you enter RUN 30000 (return), things don't work like you had hoped. Why? The desired program read the data statements of the first program. That's one of the facts of life with data-read statements.

Line 30080 lets you avoid this malady. It reads through all the data until it encounters the word START, which allows the program to exit line 30080 and get on with the reading of the data that's pertinent to this particular program. Line 30100 is its complement. When the data word END is encountered, you will exit the FOR-NEXT loop. This means that if you purposely make the FOR-NEXT loop too long and allow it to end automatically with the END word, you don't have to count the amount of data you want to read. Now you're free to add or remove data as you wish, without having to rewrite anything more than the modification.

You now have the C1P with readable text, you don't have to translate hexadecimal machine-language programs into decimal for loading, your read statements will read only the desired data and you can modify the number of data statements without having to rewrite the program. ■

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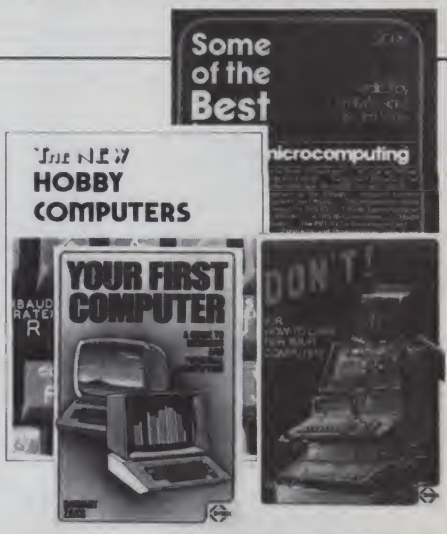
Introductory



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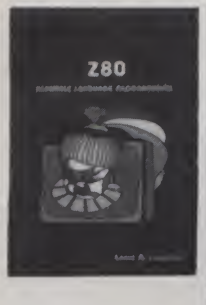

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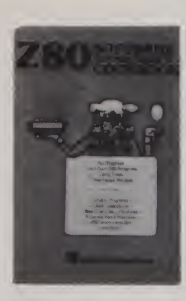

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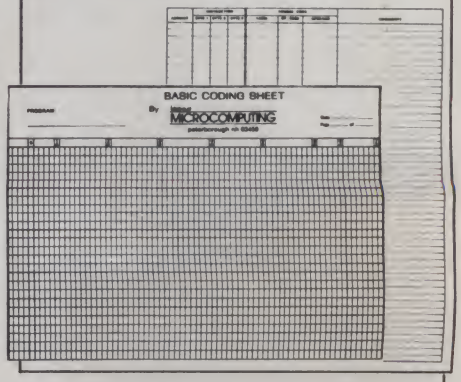

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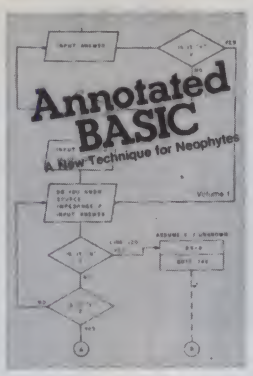

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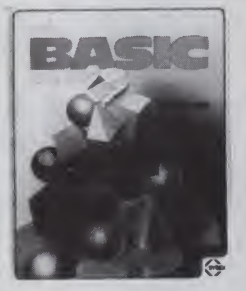

LEARNING LEVEL II—by David Lien. Written especially for the TRS-80, this book concentrates on Level II BASIC. It explores every important BASIC language capability. Updates are included for those who have studied the Level I User's Manual. Sections include: how to use the Editor, dual cassette operation, printers and peripheral devices, and the conversion of Level I programs to Level II. BK1175 $15.95.*

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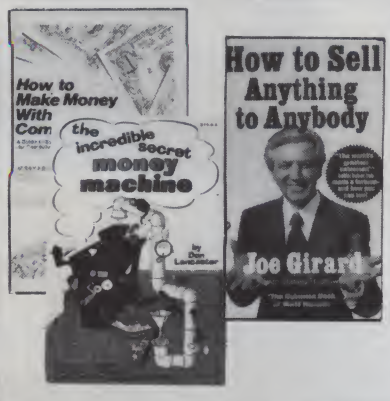

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HM6116-3	2048 x 8	(cmos) (150ns)	call	call
HM6116-2	2048 x 8	(cmos) (120ns)	call	call
HM6116LP-4	2048 x 8	(LP) (cmos) (200ns)	call	call
HM6116LP-3	2048 x 8	(LP) (cmos) (150ns)	call	call
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2716	2048 x 8	(5v) (450ns)	4.95	3.95
2716-1	2048 x 8	(5v) (350ns)	9.00	8.50
TMS2716	2048 x 8	(450ns)	9.95	8.95
TMS2532	4096 x 8	(5v) (450ns)	9.95	7.95
2732	4096 x 8	(5v) (450ns)	9.95	7.95
2732A-2	4096 x 8	(5v) (200ns)	call	call
2764	8192 x 8	(5v) (450ns)	call	call
TMS2564	8192 x 8	(5v) (450ns)	call	call

5v = Single 5 Volt Supply

EPROM ERASERS

	Timer	Capacity Chip	Intensity (uW/CM²)	
PE-14		6	5,200	83.00
PE-14T	X	6	5,200	119.00
PE-24T	X	9	6,700	175.00
PL-265T	X	20	6,700	255.00
PR-125T	X	16	15,000	349.00
PR-320T	X	32	15,000	595.00

JUNE SPECIALS

2K x 8 STATIC

TMM-2016 (200NS)

8/6.95 EA.

HM6116 (200NS)

8/7.95 EA.

64K DYNAMIC

4164 (200NS)

8/8.95 EA.

16K DYNAMIC

4116 (200NS)

8/13.95 EA.

16K EPROMS

2716 (450NS)

8/3.95 ea.

32K EPROMS

2532 or 2732 (450NS)

8/7.95 EA.

PRICES GOOD FOR THE MONTH OF JUNE ONLY
PLEASE MENTION JUNE SPECIALS WHEN ORDERING

PROMS

Order by National Part No.	Function	EQUIVALENT PART NUMBERS TI	SIG	MMI	Harris	
74S188	32x8 OC	18SA030	82S23	6330-1	7602	2.95
74S287	256x4 TS	14S10	82S129	6301-1	7611	3.25
74S288	32x8 TS	18S030	82S123	6331-1	7603	2.75
74S387	256x4 OC	14SA10	82S126	6300-1	7610	2.95
74S471	256x8 TS	18S22		6309-1		10.95
74S472	512x8 TS	18S42	82S147	6349-1	7649	10.95
74S473	512x8 OC	18SA42	82S146	6348	7648	10.95
74S474	512x8 TS	18S46	82S141	6341	7641	12.95
74S475	512x8 TS	18SA46	82S140	6340	7640	12.95
74S478	1Kx8 TS	28S86				19.95
74S570	512x4 OC	27S12	82S130	6305	7620	6.95
74S571	512x4 TS	27S13	82S131	6306-1	7621	5.95
74S572	1kx4 OC	24SA41	82S136	6352-1	7642	9.95
74S573	1kx4 TS	24S41	82S137	6353-1	7643	9.95
87S180	1kx8 OC	28SA86	82S180	6380-1	7680	19.95
87S181	1kx8 TS	28S86	82S181	6381-1	7681	16.25
87S184	2kx4 OC	24SA81	82S184		7684	17.20
87S185	2kx4 TS	24S81	82S185		7685	16.95
87S190	2kx8 OC	28SA166	82S190		76160	39.95
87S191	2kx8 TS	28S166	82S191		76161	39.95

74LS00 SERIES

74LS00	.25	74LS169	1.75
74LS01	.25	74LS170	1.75
74LS02	.25	74LS173	.80
74LS03	.25	74LS174	.95
74LS04	.25	74LS175	.95
74LS05	.25	74LS181	2.15
74LS08	.35	74LS189	9.95
74LS09	.35	74LS190	1.00
74LS10	.25	74LS191	1.00
74LS11	.35	74LS192	.85
74LS12	.35	74LS193	.95
74LS13	.45	74LS194	1.00
74LS14	1.00	74LS195	.95
74LS15	.35	74LS196	.85
74LS20	.25	74LS197	.85
74LS21	.35	74LS221	1.20
74LS22	.25	74LS240	1.29
74LS26	.35	74LS241	1.29
74LS27	.35	74LS242	1.85
74LS28	.35	74LS243	1.85
74LS30	.25	74LS244	1.29
74LS32	.35	74LS245	1.90
74LS33	.55	74LS247	.75
74LS37	.55	74LS248	1.25
74LS38	.35	74LS249	.99
74LS40	.35	74LS251	1.30
74LS42	.55	74LS253	.85
74LS47	.75	74LS257	.85
74LS48	.75	74LS258	.85
74LS49	.75	74LS259	2.85
74LS51	.25	74LS260	.65
74LS54	.35	74LS266	.55
74LS55	.35	74LS273	1.65
74LS63	1.25	74LS275	3.35
74LS73	.40	74LS279	.55
74LS74	.45	74LS280	1.98
74LS75	.50	74LS283	1.00
74LS76	.40	74LS290	1.25
74LS78	.50	74LS293	1.85
74LS83	.75	74LS295	1.05
74LS85	1.15	74LS298	1.20
74LS86	.40	74LS324	1.75
74LS90	.65	74LS352	1.55
74LS91	.89	74LS353	1.55
74LS92	.70	74LS363	1.35
74LS93	.65	74LS364	1.95
74LS95	.85	74LS365	.95
74LS96	.95	74LS366	.95
74LS107	.40	74LS367	.70
74LS109	.40	74LS368	.70
74LS112	.45	74LS373	1.75
74LS113	.45	74LS374	1.75
74LS114	.50	74LS377	1.45
74LS122	.45	74LS378	1.18
74LS123	.95	74LS379	1.35
74LS124	2.99	74LS385	1.90
74LS125	.95	74LS386	.65
74LS126	.85	74LS390	1.90
74LS132	.75	74LS393	1.90
74LS136	.55	74LS395	1.65
74LS137	.99	74LS399	1.70
74LS138	.75	74LS424	2.95
74LS139	.75	74LS447	.37
74LS145	1.20	74LS490	1.95
74LS147	2.49	74LS624	3.99
74LS148	1.35	74LS668	1.69
74LS151	.75	74LS669	1.89
74LS153	.75	74LS670	2.20
74LS154	2.35	74LS674	9.65
74LS155	1.15	74LS682	3.20
74LS156	.95	74LS683	2.30
74LS157	.75	74LS684	2.40
74LS158	.75	74LS685	2.40
74LS160	.90	74LS688	2.40
74LS161	.95	74LS689	2.40
74LS162	.95	74LS783	24.95
74LS163	.95	81LS95	1.69
74LS164	.95	81LS96	1.69
74LS165	.95	81LS97	1.69
74LS166	2.40	81LS98	1.69
74LS168	1.75		

TRANSISTORS

PN2222	10/1.00	100/ 8.99
2N2222	.25	50/10.99
2N2907	.25	50/10.99
2N3055	.79	10/ 6.99
2N3904	10/1.00	100/ 8.99
2N3906	10/1.00	100/ 8.99
1N4148 (1N914)		25/ 1.00
1N4004		10/ 1.00

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Z-80

2.5 Mhz

Z80-CPU	6.00
Z80-CTC	5.95
Z80-DART	15.25
Z80-DMA	17.50
Z80-PIO	6.00
Z80-SIO/O	18.50
Z80-SIO/1	18.50
Z80-SIO/2	18.50
Z80-SIO/9	16.95

4.0 Mhz

Z80-A-CPU	6.00
Z80-CTC	8.65
Z80A-DART	18.75
Z80A-DMA	27.50
Z80A-PIO	6.00
Z80A-SIO/O	22.50
Z80A-SIO/1, O	22.50
Z80A-SIO½2	22.50
Z80A-SIO/9	19.95

6.0 Mhz

Z80B-CPU	17.95
Z80B-CTC	15.50
Z80B-PIO	15.50

ZILOG

Z6132	34.95
Z8	39.95

IC SOCKETS

	1-99	100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39

ST = SOLDERTAIL

14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80

WW = WIREWRAP

8200

8202	34.95
8205	3.50
8212	1.85
8214	3.85
8216	1.80
8224	2.50
8226	1.80
8228	4.90
8237	19.95
8238	4.95
8243	4.45
8250	14.95
8251	4.75
8253	9.25
8253-5	9.85
8255	4.75
8255-5	5.25
8257	8.50
8257-5	8.95
8259	6.90
8259-5	7.50
8272	39.95
8275	29.95
8279	9.50
8279-5	10.00
8282	6.65
8283	6.65
8284	5.70
8286	6.65
8287	6.50
8288	25.00
8289	49.95

CONNECTORS

RS232 MALE	3.25
RS232 FEMALE	3.75
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

DIP SWITCHES

4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

8000 SERIES

8035	7.25
8039	7.95
INS8060	17.95
INS8073	29.95
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8085	7.95
8085A-2	11.95
8086	59.95
8087	Call
8088	39.95
8089	89.95
8155	7.95
8156	8.95
8185	29.95
8185-2	39.95
8741	39.95
8748	29.95
8755	32.00

9000 SERIES

9316	1.00
9334	2.50
9368	3.95
9401	9.95
9601	.75
9602	1.50
96S02	1.95

DATA ACQUISITION

ADC0800	5.55
ADC0804	4.95
ADC0809	5.25
ADC0817	10.95
DAC0800	4.95
DAC0808	4.95
DAC1020	8.25
DAC1022	5.95
MC1408L8	4.95

6800

68000	call
6800	4.95
6802	10.95
6808	13.90
6809E	19.95
6809	19.95
6810	2.95
6820	4.95
6821	4.95
6828	14.95
6840	12.95
6843	34.95
6844	25.95
6845	16.95
6847	12.25
6850	3.45
6852	5.75
6860	10.95
6862	11.95
6875	6.95
6880	2.95
6883	24.95
68047	24.95
68488	19.95
68B00	10.95
68B02	22.25
68B09E	29.95
68B09	29.95
68B10	7.95
68B21	12.95
68B45	35.95
68B50	12.95

6800 = 1 MHZ

68B00 = 2 MHZ

6500 SERIES

1 MHZ

6502	6.95
6504	6.95
6505	8.95
6507	9.95
6520	4.35
6522	8.75
6532	11.25
6545	22.50
6551	11.85

2 MHZ

6502A	9.95
6522A	11.70
6532A	12.40
6545A	28.50
6551A	12.95

3 MHZ

6502B	14.95

CRYSTALS

32.768 khz	3.95
1.0 mhz	4.95
1.8432	4.95
2.0	3.95
2.097152	3.95
2.4576	3.95
3.2768	3.95
3.579535	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
5.9904	3.95
6.0	3.95
6.144	3.95
6.5536	3.95
8.0	3.95
10.0	3.95
14.31818	3.95
15.0	3.95
16.0	3.95
18.0	3.95
18.432	3.95
20.0	3.95
22.1184	3.95
32.0	3.95

INTERSIL

ICL7103	9.50
ICL7106	9.95
ICL7107	12.95
ICL8038	3.95
ICM7107A	5.59
ICM7208	15.95

DISC CONTROLLERS

1171	24.95
1791	36.95
1793	44.95
1795	54.95
1797	54.95
6843	42.95
8272	39.95
UPD765	39.95
1691	18.95
2143	18.95

INTERFACE

8T26	1.69
8T28	2.49
8T95	.99
8T96	.99
8T97	.99
8T98	.99
DM8131	2.95
DP8304	2.29

MISC

3341	4.95
76477	3.95
AY3-8910	12.95
MC3340	1.49
95H90	7.99
11C90	13.95
8202A	34.95
3242	7.95
MC3480	9.00
MC4024	3.95
MC4044	4.50
3205	3.50

BIT-RATE GENERATORS

14411	9.95
BR1941	9.95
4702	12.95
COM5016	16.95
MM5307	10.95

UARTS

AY3-1014	6.95
AY5-1013	3.95
PT1472	9.95
TR1602	3.95
2350	9.95
TMS6011	5.95
IM6402	7.95
IM6403	8.95
INS8250	14.95

KEYBOARD CHIPS

AY5-2376	11.95
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74C922	5.25
74C923	5.50

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LINEAR

LM301	.34	LM350K	5.60	NE570	4.75	LM1800	2.99	TL071	.79	XR 2206	3.75
LM301H	.79	LM350T	4.60	NE571	3.95	LM1812	8.25	TL072	1.19	XR 2207	3.85
LM307	.45	LM358	.98	NE592	2.75	LM1815	5.20	TL074	2.19	XR 2208	3.90
LM308	.98	LM359	1.79	LM703	.89	LM1818	2.90	TL081	.79	XR 2211	5.25
LM308H	1.15	LM376	3.75	LM709	.59	LM1820	3.50	TL082	1.19	XR 2240	3.25
LM309H	1.95	LM377	2.29	LM710	.75	LM1830	3.50	TL083	1.19		
LM309K	1.49	Lm378	2.50	LM711	.79	LM1871	5.49	TL084	2.19	**RCA**	
LM310	1.75	LM379	4.50	LM723	.49	LM1872	5.49	LF347	2.19	CA 3010	.99
LM311	.64	LM380	1.29	LM723H	.55	LM1877	3.25	LF351	.60	CA 3013	2.00
LM311H	.89	LM380N-8	1.10	LM733	.98	LM1889	2.49	LF353	1.00	CA 3023	2.75
LM312H	1.75	LM381	1.60	LM741N-8	.35	LM1896	1.75	LF355	1.10	CA 3035	2.49
LM317K	3.95	LM382	1.60	LM741N-14	.35	LM2877	2.05	LF356	1.10	CA 3039	1.29
LM317	1.95	LM383	1.95	LM741H	.40	LM2878	2.25	LF357	1.40	CA 3046	1.25
LM318	1.49	LM384	1.95	LM747	.79	LM2900	.85			CA 3053	1.45
LM318H	1.59	LM386	1.50	LM748	.59	LM2901	1.00	**TI**		CA 3059	2.90
LM319H	1.25	LM387	1.40	LM1014	2.75	LM3900	.59	TL494	4.20	CA 3060	2.90
LM319	1.25	LM389	1.35	LM1303	1.95	LM3905	1.25	TL496	1.65	CA 3065	1.75
LM320 (see 7900)		LM390	1.95	LM1304	1.19	LM3909	.98	TL497	3.25	CA 3080	1.10
LM322	1.65	LM392	.69	LM1305	1.49	LM3911	2.25	75107	1.49	CA 3081	1.65
LM323K	4.95	LM394H	3.60	LM1307	.85	LM3914	3.95	75110	1.95	CA 3082	1.65
LM324	.59	LM399H	5.00	LM1310	2.90	LM3915	3.95	75188	1.25	CA 3083	1.55
LM329	.69	NE531	3.75	MC1330	1.89	LM3916	3.95	75189	1.25	CA 3086	.80
LM331	3.95	NE536	6.00	MC1349	1.89	MC4024	3.95	75450	.59	CA 3089	2.99
LM334	1.30	NE555	.39	MC1350	1.29	MC4044	4.50	75451	.39	CA 3906	3.49
LM335	1.40	NE556	.69	MC1358	1.79	RC4136	1.25	75452	.39	CA 3130	1.30
LM336	1.75	NE558	1.50	LM1414	1.59	RC4151	3.95	75453	.39	CA 3140	1.15
LM337K	3.95	NE561	19.95	LM1458	.69	LM4250	1.75	75454	.39	CA 3146	1.85
LM337T	2.95	NE562	6.00	LM1488	.99	LM4500	3.25	75491	.79	CA 3160	1.19
LM338K	6.95	NE564	3.95	LM1489	.99	LM13080	1.29	75492	.79	CA 3401	.59
LM339	.99	LM565	.99	LM1496	.85	LM13600	1.49	75493	.89	CA 3600	3.45
LM340 (see 7800)		LM566	1.49	LM1558H	3.10	LM13700	1.49	75494	.89		
LM348	1.20	LM567	1.29								

CLOCK CIRCUITS

MM5314	4.95
MM5369	3.95
MM5375	4.96
MM58167	8.95
MM58174	11.95
MSM5832	8.95

FUNCTION GENERATORS

MC4024	Dual VCO	3.95
LM566	Function Generator	1.49
XR2206	Function Generator	3.75
8038	Waveform Generator	3.95

VOLTAGE REG's

7805T	.79	7905T	.89
7808T	.99	7912T	.89
7812T	.79	7915T	1.19
7815T	.99	7924T	1.19
7824T	.99		
		7905K	1.49
7805K	1.39	7912K	1.49
7812K	1.39	79LO5	.79
7815K	1.39	79L12	.79
78LO5	.69	79L15	.79
78L12	.69		
78L15	.69		
		LM317K	3.95
LM309K	1.49	LM323K	4.95
LM317T	1.95	LM337K	3.95

T = TO-220 K= TO-3 L = TO-92

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7400	.19	74136	.50
7401	.19	74141	.65
7402	.19	74142	2.95
7403	.19	74143	2.95
7404	.19	74145	.60
7405	.25	74147	1.75
7406	.29	74148	1.20
7407	.29	74150	1.35
7408	.24	74151	.65
7409	.19	74152	.65
7410	.19	74153	.55
7411	.25	74154	1.40
7412	.30	74155	.75
7413	.35	74156	.65
7414	.55	74157	.55
7416	.25	74159	1.65
7417	.25	74160	.85
7420	.19	74161	.70
7421	.35	74162	.85
7422	.29	74163	.85
7423	.29	74164	.85
7425	.29	74165	.85
7426	.29	74166	1.00
7427	.29	74167	2.95
7428	.45	74170	1.65
7430	.19	74172	5.95
7432	.29	74173	.75
7433	.45	74174	.89
7437	.29	74175	.89
7438	.29	74176	.89
7440	.19	74177	.75
7442	.49	74178	1.15
7443	.65	74179	1.75
7444	.69	74180	.75
7445	.69	74181	2.25
7446	.59	74182	.75
7447	.69	74184	2.00
7448	.69	74185	2.00
7450	.19	74186	18.50
7451	.23	74190	1.15
7453	.23	74191	1.15
7454	.23	74192	.79
7460	.23	74193	.79
7470	.35	74194	.85
7472	.29	74195	.85
7473	.34	74196	.79
7474	.35	74197	.75
7475	.49	74198	1.35
7476	.35	74199	1.35
7480	.59	74221	1.35
7481	1.10	74246	1.35
7482	.95	74247	1.25
7483	.50	74248	1.85
7485	.65	74249	1.95
7486	.35	74251	.75
7489	4.95	74259	2.25
7490	.35	74265	1.35
7491	.40	74273	1.95
7492	.50	74276	1.25
7493	.49	74279	.75
7494	.65	74283	2.00
7495	.55	74284	3.75
7496	.70	74285	3.75
7497	2.75	74290	.95
74100	1.00	74293	.75
74107	.30	74298	.85
74109	.45	74351	2.25
74110	.45	74365	.65
74111	.55	74366	.65
74116	1.55	74367	.65
74120	1.20	74368	.65
74121	.29	74376	2.20
74122	.45	74390	1.75
74123	.55	74393	1.35
74125	.45	74425	3.15
74126	.45	74426	.85
74128	.55	74490	2.55
74132	.45		

CMOS

74C00	.35	4019	.45
74C02	.35	4020	.95
74C04	.35	4021	.95
74C08	.35	4022	1.15
74C10	.35	4023	.35
74C14	1.50	4024	.75
74C20	.35	4025	.35
74C30	.35	4026	1.65
74C32	.50	4027	.65
74C42	1.75	4028	.80
74C48	1.20	4029	.95
74C73	.65	4030	.45
74C74	.85	4034	2.95
74C76	.80	4035	.85
74C83	1.95	4040	.95
74C85	1.95	4041	1.25
74C86	.95	4042	.75
74C89	4.50	4043	.85
74C90	1.75	4044	.85
74C93	1.75	4046	.95
74C95	1.75	4047	.95
74C107	1.00	4049	.55
74C150	5.75	4050	.55
74C151	2.25	4051	.95
74C154	3.25	4053	.95
74C157	1.75	4060	1.45
74C160	2.00	4066	.75
74C161	2.00	4068	.40
74C162	2.00	4069	.35
74C163	2.00	4070	.35
74C164	2.00	4071	.30
74C165	2.00	4072	.30
74C173	2.00	4073	.30
74C174	2.25	4075	.30
74C175	2.25	4076	.95
74C192	2.25	4078	.30
74C193	2.25	4081	.30
74C195	2.25	4082	.30
74C200	5.75	4085	.95
74C221	2.25	4086	.95
74C373	2.75	4093	.95
74C374	2.75	4098	2.49
74C901	.80	4099	1.95
74C902	.85	14409	12.95
74C903	.85	14410	12.95
74C905	10.95	14411	11.95
74C906	.95	14412	12.95
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74C910	9.95	4508	1.95
74C911	10.00	4510	.95
74C912	10.00	4511	.95
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74C918	2.75	4515	2.25
74C920	17.95	4516	1.55
74C921	15.95	4518	1.25
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74C923	5.95	4520	1.25
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74C926	7.95	4526	1.25
74C927	7.95	4527	1.95
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4000	.35	4538	1.95
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4006	.95	4555	.95
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74S40	.44	74S253	7.45	74S257	1.39		
74S51	.78	74S157	1.19	74S258	1.49		
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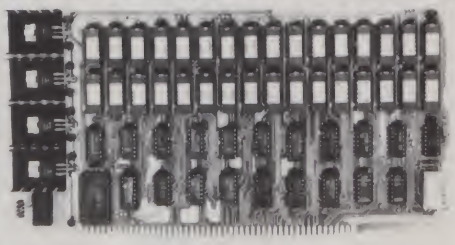

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7432N	49	LM320T 15	85	CD4026	1 65	2114 4	4 95	2716 5 volt	5 50
7445N	69	LM323K 5	4 95	CD4027	65	2114 3	4 75	8 2716 5 Volt	39 00
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7489N	1 70	LM340K 15	1 35	CD4042	75	4116 200ns	1	8755A	44 95
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7495N	55	LM340T 5	75	CD4044	85	MM5290	3 00	N82S123	3 95
74100N	1 00	LM340T 8	75	CD4046	95	MM5299	9 95	N82S126	5 75
74107N	30	LM340T 12	75	CD4049	45	MM5310	5 94	N82S129	4 75
74123N	55	LM340T 15	75	CD4050	55	P5101	8 95	N82S131	4 95
74125N	45	LM340T 18	75	CD4051	95	2101A	1	N82S136	4 75
74145N	60	LM340T 24	75	CD4066	1 40	4044	1	N82S137	4 75
74150N	1 20	LM350	5 50	CD4066	1	4116	10 00	DM8577	40
74151N	65	LM377	2 79	CD4068	39	4116	2 50	8223	1 50
74154N	1 25	LM380N	1 00	CD4069	35	TMM2016	16 95		
74157N	55	LM381	1 60	CD4070	35	HM4716	16 50	**CONNECTORS**	
74161N	70	LM382	1 60	CD4071	30			50 pin edge	2 50
74162N	85	LM709H	59	CD4072	30	**CLOCKS**		44 pin edge	2 50
74163N	85	LM723H N	49	CD4073	35	MM5311	4 95	86 pin edge	4 00
74174N	89	LM733N	85	CD4075	30	MM5312	3 90	100 pin edge	1 95
74175N	85	LM741H	35	CD4076	95	MM5314	3 90	100 pin edge w w 4	4 95
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74192N	79	LM747H N	75	CD4081	30	MM5841	14 45	**IC SOCKETS**	
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74366N	65	LM1307	1 10	CD4508	1 95	MM5375AE N	4 90	16 16	18 45
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74LS05N	25	LM3900N	59	CD4527	1 51	6502	6 95	16 57 28 1 00	
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74LS28N	35	NE565A	1 00	74C00	35	6800	5 70	2 MHz	3 95
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74LS75N	50	78L08	60	74C30	35	8085A	18 MHz	3 90	
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74LS95N	85	75491CN	50	74C76	80	Z80 P10	18 95	32768 Hz	4 00
74LS107N	40	75492CN	55	74C90	1 25	Z80A P10	6 50	1 8432 MHz	4 50
74LS112N	45	75494CN	89	74C93	1 25	Z80B P10	5 95	3 5795 MHz	1 20
74LS113N	45			74C154	3 25	Z80A CTC	5 95	2 0100 MHz	1 95
74LS132N	75	**A to D CONVERTER**		74C160	69	Z80B CTC	7 95	2 097152 MHz	3 95
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74LS155N	79	8701CN	22 00	74C221	1 90	Z80A DART	18 75	5 0688 MHz	3 95
74LS157N	75	8750CJ	13 95	74C905	6 00	Z80 DMA	17 50	5 185 MHz	3 95
74LS162N	95	LD130	9 95	74C906	75	Z80A DMA	21 50	5 1441 MHz	3 95
74LS163N	95	9400CJ/V F	40	74C914	1 95	Z80 SIO/0	23 95	5 5296 MHz	3 95
74LS174N	95	ICL7103	9 50	74C922	5 00	Z80A SIO/0	23 95	6 5536 MHz	3 95
74LS190N	1 00	ICL7107	14 25	74C923	5 50	Z80 SIO/2	23 95	7 0656 MHz	3 95
74LS221N	1 15			74C925	6 75	Z80A SIO/2	28 95	7 1680 MHz	3 95
74LS258N	69	**CMOS**		74C926	6 95	Z80B CTC	17 95	8 MHz	3 95
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LINEAR		CD4002	35	**INTERFACE**		8214	3 75	14 318 MHz	5 49
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RCA Cosmac 1802 Super Elf Computer $106.95

The Super Elf is a small single board computer that does many **big** things. It's an excellent computer for training and for learning programming with its machine language and yet it's easily **expanded** with **additional memory, Full Basic, ASCII Keyboards, video character generation, etc.**

ROM monitor; State and Mode displays; Single step; Optional address displays; Power Supply; Audio Amplifier and Speaker; Fully socketed for all IC's; Full documentation.

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP for program debugging** which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the **unique Quest** address and data bus displays **before, during** and **after** executing instructions. Also, CPU mode and instruction cycle are decoded and displayed on 8 LED indicators.

An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step.** Large, on board displays provide output and optional **high and low address.** There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** All metal Expansion Cabinet, painted and silk screened, with room for 5S-100 boards and power supply **$57.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for $12.00 per 12 issues. Single issues $1.50. Issues 1-12 bound $16.50.

Moews Video Graphics **$3.50,** Games and Music **$3.00,** Chip 8 Interpreter **$5.50,** Starship 4K cassette **$14.95.** Exciting and challenging space game. Complete manual included.

Free 14 page brochure of complete Super Elf system.

Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor $19.95 is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50.** A **50 pin connector set** with ribbon cable is available at **$18.95** for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply below).

Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range ± $10^{\pm 38}$), 32 bit integer ±2 billion, multi dim arrays, string arrays, string manipulation, cassette I/O, save and load, basic, data and machine language programs, and over 75 statements, functions and operations.

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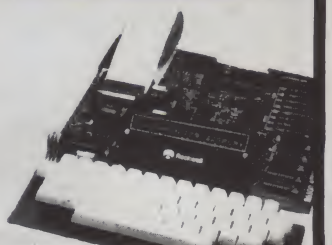

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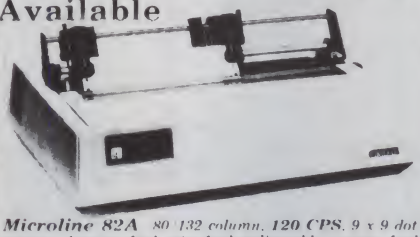

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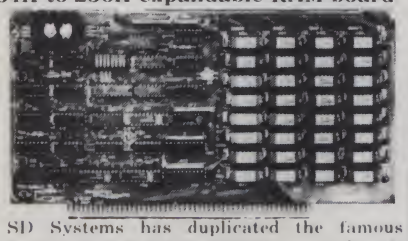

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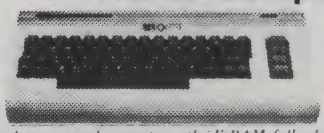

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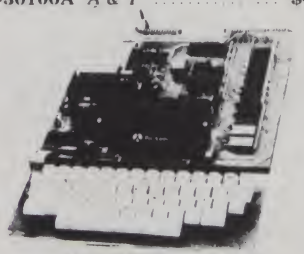

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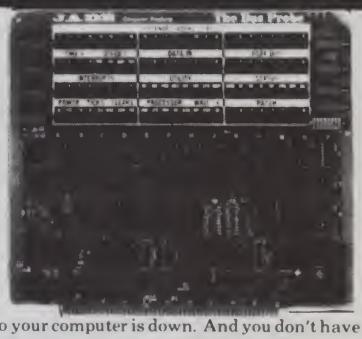

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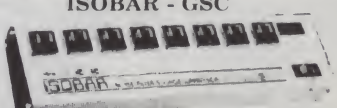

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KIT	$135.95. A & T	$185.95
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KIT	$299.95. A & T	$339.95

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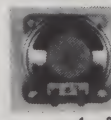

National Semiconductor

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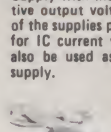

FEATURES:
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(Picture not shown but similar in construction to above)

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2102	1024x1 Static	1.75
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M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00

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2400-19

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THE MOST UNIQUE DIP SWITCH AVAILABLE!

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- Terminals on .100 x .300 (2.54 x 7.82) centers • PCB or dip socket mountable • Positive cleaning/wiping action with gold contact • Total seal and bottom seal

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2400-ABCD	4	ABCD	8 pin	.99 - 10/ 9.95
2400-5C	9	C54321	14 pin	1.09 - 10/ 9.95
2400-6	6	123456	14 pin	1.09 - 10/ 9.95
2400-7	7	1234567	14 pin	1.19 - 10/10.95
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2400-10	10	0123456789	20 pin	1.49 - 10/13.95

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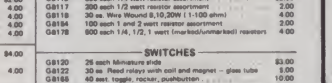

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GB102	60 each Electrolytics	4.00
GB103	40 each Tantalum (tubular & dipped)	4.00
GB178	40 each Dipped Mica (10pf-1000pf @ 100-500V)	4.00

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GB187	60 each DTL Series - marked (DM8830, 932, 936, 946, etc.)	3.00
GB188	8 pcs. Positive Voltage Regulators (TO-3 case) (7805, 06, 12, 15, 18, 24, etc.) Linear marked	4.25
GB189	8 pcs. Negative Voltage Regulators (TO-3 case) (7905, 06, 12, 15, 18, 24, etc.) Linear marked	4.00
GB170	25 each Assorted 74LS TTL Series	4.00
GB172	10 pcs. 78M Positive Volt. Reg. (TO-5 case) (78M05, 8, 12, 15, 20, 24, etc.) Linear marked	5.00

LEDS – LAMPS – READOUTS

GB110	100 each Assorted LEDs (colors & sizes) (T1, T1¾)	99.00
GB111	40 each NE-2 Neon Type Lamps	3.00
GB112	20 ea. Multiple Readouts, calculators, clocks, timers, LEDS to Panaplex - new, used and rejects	4.00
GB182	50 each 7-Segment Displays (various colors and sizes)	8.00

POTENTIOMETERS

GB113	30 each Miniature Trimmers (100 ohm-1 Meg)	$4.00
GB134	24 each 3/8" square single-turn PC Mount (untested - 10 ohm to 500 ohm) marked	3.00
GB135	24 each 3/8" square single-turn PC Mount (untested - 1K to 50K) marked	3.00
GB136	24 each 3/8" square single-turn PC Mount (untested - 100K to 5 Meg) marked	3.00
GB173	100 ea. 3/8" sq. single-turn (U Test & Sort)	9.00
GB174	25 ea. ¼ watt thumbwheel single-turn (500 ohm-5 Meg)	2.00

DIODES

GB171	60 each Assorted Germanium (1N34, 1N88, 1N270)	$2.00
GB107	100 each Silicon (1N914/1N4148)	2.00
GB164	200 each mini-lead, unmarked rectifiers & zeners	2.00
GB175	100 ea. 1 amp - 3 amp (cathode band) silicon rectifiers	3.00

RESISTORS

Part No.	Description	Price
GB119	200 each 1/4 watt resistor assortment	$2.00
GB117	200 each 1/2 watt resistor assortment	2.00
GB118	30 ea. Wire Wound 8,10,20W (1-100 ohm)	4.00
GB184	100 each 1 and 2 watt resistor assortment	2.00
GB178	600 each 1/4, 1/2, 1 watt (matched/unmarked) resistors	4.00

SWITCHES

GB120	25 each Miniature SPDT	$3.00
GB122	20 ea. Reed relays with coil and magnet - glass tube	5.00
GB168	40 asst. toggle, rocker, pushbutton	10.00
GB178	30 each Dip Switches (asst. positions)	9.95

HARDWARE

GB136	40 each Terminal Strips (insl and screw types (3 to 6 terminals)	$3.00
GB140	150 each Spacers, standoff, insulators (metal, nylon and plastic)	2.00
GB141	200 each Washers and Spacers (nylon and teflon)	2.00
GB142	50 ea. Chassis mounting feet (rubber and plastic)	2.00
GB144	200 each Solder Lugs (asst)	2.00
GB145	100 each Lugs - crimp on (some insulated)	2.00
GB146	100 each Grommets, cord stain relefs and hole plugs	2.00
GB147	600 each Hardware mix (nuts, bolts, screws, lugs)	8.00
GB189	48 Threaded metal and plastic spacers (¾-2" long)	2.00
GB187	200 pcs. sheet metal and metal tapping screws	2.00
GB188	200 pcs. angle bkts, chip insulators, etc.	2.00
GB189	100 pcs. tie wraps and harness clips (3-6")	3.00
GB180	100 pcs. Robot/Slot Car, gears, shafts, wheels, motors	9.95

MISCELLANEOUS

GB123	30 each Heat Sinks - assorted sizes	$3.00
GB124	8 each assorted calculator type keyboards	8.00
GB126	50 each Opto Isolators - HL-1 Series (untested)	2.00
GB127	100 each Transistors - plastic and power	3.00
GB128	20 each Transit Cases - wire and tape	4.00
GB129	50 each Photo Transistors (LPT)	4.00
GB130	1 each Tape Drive - 8V motor with read/write erase head and 2 cassette tapes (no amplifier)	9.00
GB131	30 each 6" shrink tubing, asst. sizes and colors	4.00
GB137	60 each Chokes, coils and inductors (molded-wire-adjustable)	3.00
GB138	2 each Speakers, 2¼" 8 ohm, 1/4 watt	1.95
GB155	300 each mixed resistors, capacitors diodes, transistors, chokes	3.00
GB180	Printed Circuit Board Contains 50-70 components on each board	2.00
GB163	30 ea. Sockets (Asst. IC and transistor)	4.00
GB177	200 each 1" Shrink tubing, asst. colors and sizes	3.00

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6% Sales Tax
Postage — Add 5% plus $1.50 Insurance
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BOOKS

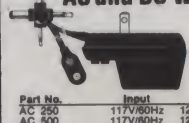
National Semiconductor — Intersil — Intel

30001	National CMOS Data Book (840 pages) 74C, CD4000, and A/D Converters	$6.95
30002	National Interface Data Book [704 pages) DP, DS8000, DS3600, DS75000, etc.	$6.95
30003	National Linear Data Book [1376 pages) LM, LF, ADC, DAC, LH Series	$11.95
30004	National Series 80 — Board Level Computer [224 pages)	$4.95
30006	National TTL Logic Data Book (624 pages) 7400,LS,L,H,S, and DM8000 Series	$6.95

30006 Above (3) 30001,3,5 as set $24.95/lot

010400	Intel Component Data Catalog Full data sheets for Intel's products incl. memory devices, microproc., peripherals & indust./mil. products (1328 pages)	$14.95
205610	Intel Peripheral Design Handbook Full data sheets, appl. notes for Intel peripheral device components (644 pages)	$6.95

AC and DC Wall Transformers



With Universal Plug and 9V Battery Snap

Selective voltages: 6,9,12VDC. Polarity selection (+/-). six-foot line from adapter to plugs — six-inch line from adapter to battery snap. 120V/60Hz. 300mA.

Part No.	Input	Output	Price
AC 250	117V/60Hz	12VAC 250mA	$3.95
AC 500	117V/60Hz	12VAC 500mA	$4.95
AC1000	117V/60Hz	12VAC 1 amp	$5.95
AC1700	117V/60Hz	9VAC 1.7 amp	$3.95
DC 800	120V/60Hz	6VDC 400mA (batt. charger)	$1.95
DC9912 (above)	120V/60Hz	6,9,12VDC 300mA	$9.95
DV9200	117V/60Hz	9VDC 200mA	$3.25
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	12VDC 300mA	$2.95

CONNECTORS

DB25P	D-Subminiature Plug	$2.95
DB25S	D-Subminiature Socket	$3.50
D20418-2	Screw Lock Hdwr. (2) DB25S/P	2/$.99
DB51226	Cover for DB25P/S	$1.75
22/44SE	P.C. Edge (22/44 Pin)	$2.95
UG88/U	BNC Plug	$1.79
UG89/U	BNC Jack	$3.79
UG175/U	UHF Adapter	$ .49
SO239	UHF Panel Recp.	$1.29
PL258	UHF Adapter	$1.60
PL259	UHF Plug	$1.60
UG260/U	BNC Plug	$1.79
UG1094/U	BNC Bulkhead Recp.	$1.29

TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K
Kit comes complete with:
- 8 ea. MM5290 (UPD416/4116) 16K Dyn. Ram (*ns)
- Documentation for conversion

TRS-16K2 *150ns 19.95
TRS-16K3 *200ns 16.95
TRS-16K4 *250ns 14.95

KEYBOARDS

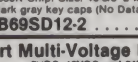
Limited Quantity

Datanectics 74-Key Keyboard

Uses EA 20134 Chip (Electronic Arrays). Size: 16¾"L x 5½"W x 1-3/8"H. White, black, blue, grey key caps. (No Data Sheet) —

Part No. KB354 ..... $29.95 ea.

Limited Quantity



Micro Switch 69-Key Keyboard

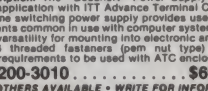
Uses AMI SW20350K Chip. Size: 16-3/8"L x 5¼"W x 1-5/8"H Metal Frame. Light & dark gray key caps (No Data Sheet)

Part No. KB69SD12-2 ..... $19.95 ea.

Boschert Multi-Voltage Power Supply

5VDC, 12VDC and 24VDC

Limited Quantity



FEATURES: Voltages*: 5VDC @ 25amps, 12VDC @ 4amps, & 24VDC @ 4amps. Reg. Load: +5V out ±1%, +12 & 24V out ±5% (20-100% load). Overvolt. & overcurr. protection. 115 or 230VAC input. Wt. 4 lbs. Size: 4.95" x 2.50" x 15.00"
*Total average output shall not exceed 200 watts.

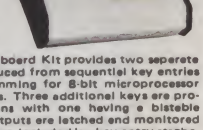
General Description: The "Boschert" Power Supply was originally designed for application with ITT Advance Terminal Controller (ATC). This open frame switching power supply provides user with high current requirements common in use with computer systems. Its compact size provides versatility for mounting into electronic enclosures. Each supply has 6 threaded fastaners (pem nut type) for mounting. Specification requirements to be used with ATC enclosed.

Part No. 200-3010 ..... $69.95 each

— MANY OTHERS AVAILABLE • WRITE FOR INFORMATION —

JE600 Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT
19-KEY KEYBOARD



The JE600 Encoder Keyboard Kit provides two seperate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3½"H x 8¼"W x 8¾"D

JE600/DTE-HK (After assembled as pictured above) **$99.95**

JE600 Kit	19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case)	$59.95
K19	19-Key Keyboard (Keyboard only)	$14.95
DTE-HK	(case only — 3½"Hx8¼"Wx8¾"D)	$44.95

7400

SN7400N	.20	SN7472N	.29	SN74156N	.79
SN7401N	.20	SN7473N	.35	SN74157N	.69
SN7402N	.25	SN7474N	.35	SN74160N	.89
SN7403N	.25	SN7475N	.49	SN74161N	.89
SN7404N	.25	SN7476N	.35	SN74162N	.89
SN7405N	.29	SN7479N	5.00	SN74163N	.89
SN7406N	.35	SN7480N	.50	SN74164N	.89
SN7407N	.35	SN7482N	.99	SN74165N	.89
SN7408N	.29	SN7483N	.69	SN74166N	1.25
SN7409N	.29	SN7485N	.89	SN74167N	2.79
SN7410N	.25	SN7486N	.35	SN74170N	1.95
SN7411N	.29	SN7489N	1.75	SN74172N	4.95
SN7412N	.35	SN7490N	.49	SN74173N	1.39
SN7413N	.40	SN7491N	.59	SN74174N	.99
SN7414N	.69	SN7492N	.45	SN74175N	.89
SN7416N	.29	SN7493N	.45	SN74176N	.79
SN7417N	.29	SN7494N	.69	SN74177N	.79
SN7420N	.25	SN7495N	.69	SN74179N	1.49
SN7421N	.29	SN7496N	.69	SN74180N	.79
SN7422N	.45	SN7497N	3.00	SN74181N	2.25
SN7423N	.29	SN74100N	1.49	SN74182N	.79
SN7425N	.29	SN74104N	.89	SN74184N	2.49
SN7426N	.29	SN74105N	.89	SN74185N	2.49
SN7427N	.25	SN74107N	.35	SN74190N	1.25
SN7428N	.49	SN74109N	.39	SN74191N	1.25
SN7430N	.25	SN74116N	1.95	SN74192N	.89
SN7432N	.29	SN74121N	.39	SN74193N	.89
SN7437N	.25	SN74122N	.55	SN74194N	.89
SN7438N	.40	SN74123N	.59	SN74195N	.69
SN7439N	.25	SN74125N	.49	SN74196N	.89
SN7440N	.20	SN74126N	.49	SN74197N	.89
SN7441N	.89	SN74132N	.75	SN74198N	1.49
SN7442N	.59	SN74136N	.75	SN74199N	1.49
SN7443N	1.10	SN74141N	.99	SN74221N	1.25
SN7444N	1.10	SN74142N	3.25	SN74251N	.99
SN7445N	.89	SN74143N	3.49	SN74276N	1.95
SN7446N	.79	SN74144N	3.49	SN74279N	.79
SN7447N	.69	SN74145N	.79	SN74283N	1.49
SN7448N	.79	SN74147N	1.95	SN74284N	3.95
SN7450N	.20	SN74148N	1.29	SN74285N	3.95
SN7451N	.20	SN74150N	1.25	SN74365N	.69
SN7453N	.20	SN74151N	.69	SN74366N	.69
SN7454N	.20	SN74152N	.69	SN74367N	.69
SN7459A	.25	SN74153N	.79	SN74368N	.69
SN7460N	.20	SN74154N	1.25	SN74390N	1.49
SN7470N	.29	SN74155N	.79	SN74393N	1.49

74LS

74LS00	.29	74LS92	.75	74LS192	1.15
74LS01	.29	74LS93	.75	74LS193	1.15
74LS02	.29	74LS95	.99	74LS194	1.15
74LS03	.29	74LS96	1.15	74LS195	1.15
74LS04	.35	74LS107	.45	74LS197	1.19
74LS05	.35	74LS109	.45	74LS221	1.19
74LS08	.35	74LS112	.45	74LS240	1.49
74LS09	.35	74LS113	.49	74LS241	1.49
74LS10	.35	74LS114	.49	74LS242	1.49
74LS11	.39	74LS122	.89	74LS243	1.49
74LS12	.35	74LS123	1.25	74LS244	1.49
74LS13	.59	74LS125	.59	74LS245	2.95
74LS14	.99	74LS126	.59	74LS247	1.19
74LS15	.35	74LS132	.99	74LS248	1.19
74LS20	.35	74LS133	.89	74LS249	1.19
74LS21	.35	74LS136	.49	74LS251	.99
74LS22	.35	74LS138	.89	74LS253	.99
74LS26	.35	74LS139	.89	74LS257	.89
74LS27	.35	74LS151	.89	74LS258	.69
74LS28	.35	74LS153	.89	74LS260	.69
74LS30	.35	74LS154	1.75	74LS266	.69
74LS32	.35	74LS155	.89	74LS273	1.95
74LS33	.59	74LS156	.89	74LS279	.89
74LS37	.45	74LS157	.89	74LS283	.89
74LS38	.39	74LS158	.89	74LS290	.99
74LS40	.35	74LS160	1.15	74LS293	.99
74LS42	.89	74LS161	1.15	74LS298	1.25
74LS47	.89	74LS162	1.15	74LS352	1.29
74LS48	1.15	74LS163	1.15	74LS353	1.29
74LS49	1.15	74LS164	1.15	74LS365	.69
74LS51	.35	74LS165	1.15	74LS366	.69
74LS54	.35	74LS168	1.19	74LS367	.69
74LS55	.35	74LS169	1.19	74LS368	.69
74LS73	.45	74LS170	1.95	74LS373	1.95
74LS74	.45	74LS173	.99	74LS374	1.95
74LS75	.59	74LS174	.99	74LS375	.89
74LS76	.45	74LS175	.99	74LS386	.69
74LS78	.49	74LS181	2.95	74LS393	2.49
74LS83	.89	74LS190	1.25	74LS399	2.49
74LS85	1.25	74LS191	1.25	74LS670	2.49
74LS86	.49			81LS95	1.95
74LS90	.69			81LS97	1.95

74S

74S00	.45	74S124	3.95	74S243	3.25
74S02	.45	74S133	.55	74S244	3.25
74S03	.45	74S134	.69	74S251	1.45
74S04	.55	74S135	1.19	74S253	1.45
74S05	.55	74S136	1.75	74S257	1.35
74S08	.50	74S138	1.35	74S258	1.35
74S09	.50	74S139	1.35	74S260	.79
74S10	.45	74S140	.79	74S280	2.95
74S11	.45	74S151	1.35	74S287	3.25
74S15	.45	74S153	1.35	74S288	2.75
74S20	.45	74S157	1.35	74S373	3.49
74S22	.45	74S158	1.35	74S374	3.49
74S30	.45	74S160	2.95	74S387	2.95
74S32	.55	74S174	1.59	74S471	10.95
74S38	1.25	74S175	1.59	74S472	10.95
74S40	.50	74S188	2.95	74S473	10.95
74S51	.45	74S194	1.95	74S474	12.95
74S64	.50	74S195	1.95	74S475	12.95
74S65	.50	74S196	1.95	74S570	5.95
74S74	.75	74S240	2.95	74S571	5.95
74S86	.79	74S241	2.95	74S572	9.95
74S112	.79	74S242	3.25	74S573	9.95
74S113	.79			74S940	3.15
74S114	.79			74S941	3.15

CA–LINEAR

CA3010H	.99	CA3060N	3.25	CA3089N	3.75
CA3013H	2.15	CA3080H	1.25	CA3096N	3.95
CA3023H	3.25	CA3081N	2.00	CA3130H	1.39
CA3035H	2.49	CA3082N	2.00	CA3140H	1.25
CA3039H	1.35	CA3083N	1.60	CA3160H	1.25
CA3046N	1.30	CA3086N	.85	CA3401N	.59
CA3059N	3.25			CA3600N	3.50

CD–CMOS

CD4000	.39	CD4041	1.49	CD 4098	2.49
CD4001	.39	CD4042	.99	CD4506	.75
CD4002	.39	CD4043	.89	CD4507	.99
CD4006	1.19	CD4044	.89	CD4508	3.95
CD4007	.25	CD4046	1.79	CD4510	1.39
CD4009	.49	CD4047	2.50	CD4511	1.29
CD4010	.49	CD4048	1.35	CD4512	1.49
CD4011	.39	CD4049	.49	CD4514	3.95
CD4012	.25	CD4050	.69	CD4515	2.95
CD4013	.49	CD4051	1.19	CD4516	1.49
CD4014	1.39	CD4052	1.19	CD4518	1.79
CD4015	1.19	CD4053	1.19	CD4519	.89
CD4016	.59	CD4056	2.95	CD4520	1.29
CD4017	1.19	CD4059	9.95	CD4526	1.79
CD4018	.99	CD4060	1.49	CD4528	1.79
CD4019	.49	CD4066	.79	CD4529	1.95
CD4020	1.19	CD4068	.39	CD4543	2.79
CD4021	1.39	CD4069	.45	CD4562	11.95
CD4022	1.19	CD4070	.55	CD4566	2.79
CD4023	.29	CD4071	.49	CD4583	2.49
CD4024	.79	CD4072	.49	CD4584	.75
CD4025	.23	CD4073	.39	CD4723	1.95
CD4026	2.95	CD4075	.39	CD4724	1.95
CD4027	.69	CD4076	1.39	MC14409	17.95
CD4028	.89	CD4078	.55	MC14410	18.95
CD4029	1.49	CD4081	.39	MC14411	15.95
CD4030	.49	CD4082	.39	MC14412	15.95
CD4034	3.49	CD4093	.99	MC14419	7.95
CD4035	.99			MC14433	15.95
CD4040	1.49			MC14538	2.49
				MC14541	1.95

A·AMBER — **LEDS** — G·GREEN
R·RED Y·YELLOW C·CLEAR

OPTO ELECTRONICS

DIFFUSED BI-COLOR/TRI-STATE — 200 (T1¾) Red Green

Part No	1-99	100+
XC5491	[illegible]	[illegible]

POINT SOURCE (RED) — 180 Tapered (Short)

Part No	1-99	100+
RL 2-[illegible]	5/1.00	$.17 ea.

DIFFUSED — 125 (T1)

Part No	1-99	100+
XC209R	5/1.00	.17
XC209G	4/1.00	.20
XC209Y	4/1.00	.20

DIFFUSED — 200 dia (T1¾ Low Profile)

Part No	1-99	100+
XC22R	5/1.00	.17
XC22G	4/1.00	.20
XC22Y	4/1.00	.20

WIDE ANGLE DIFFUSED — 190 Diameter

Part No	1-99	100+
XC111R	5/1.00	.17
XC111G	4/1.00	.20
XC111Y	4/1.00	.20
XC111C	4/1.00	.20

DIFFUSED — 180 Dia (Tapered)

Part No	1-99	100+
XC526R	5/1.00	.17
XC526G	4/1.00	.20
XC526Y	4/1.00	.20
XC526C	4/1.00	.20

POINT SOURCE — 200 (T1¾)

Part No	1-99	100+
XC564R	5/1.00	.17
XC564G	4/1.00	.20
XC564Y	4/1.00	.20
XC564C	4/1.00	.20

DIFFUSED — 200 (T1¾)

Part No	1-99	100+
XC556R	5/1.00	.17
XC556G	4/1.00	.20
XC556Y	4/1.00	.20
XC556C	4/1.00	.20
XC556A	4/1.00	.20

DIFFUSED TRIANGLE — 200 Triangle

Part No	1-99	100+
XC330R	5/1.00	.17
XC330G	4/1.00	.20
XC330Y	4/1.00	.20

DIFFUSED RECTANGULAR — 180W x .200L (.271H)

Part No	1-99	100+
XC5212[4]G	[illegible]	[illegible]
XC5312[4]Y	[illegible]	[illegible]
XC5712[4]R	[illegible]	[illegible]

LED Mounting Hardware

Mounts in panels up to .125" thick. Drill .257" diameter hole (F Drill). Can be used with XC22, XC111, XC526, XC564 and XC556 Series (from .180" to .200 Dia.) Black plastic clip and ring.

Part No	8-99	100+
LMH-200	8/$1.00	.08 ea.

—DISPLAY LEDS—

Part No.	Size	Color	Description	Price
MAN 1	.270	Red	C.A. (LHDP)	$2.95
MAN 2	.320	Red	5x7 Alphanumeric (TIL306)	4.95
MAN 52	.300	Green	C.A. (LHDP)	.99
MAN 54	.300	Green	C.C. (RHDP)	.99
MAN 72	.300	Red	C.A. (LHDP)	.75
MAN 74	.300	Red	C.C. (RHDP)	1.25
NSN 74L	.300	Red	C.C. (LHDP)	.99
MAN 82	.300	Yellow	C.A. (LHDP)	.49
MAN 84	.300	Yellow	C.C. (RHDP)	.99
MAN 3620	.300	Orange	C.A. (LHDP)	.49
MAN 3630	.300	Orange	C.A. (±1) Over Flo	.99
MAN 4610	.400	Orange	C.A. (RHDP)	.99
MAN 6610	.560	Orange	C.A. (RHDP) 2 Digit	.99
MAN 6630	.560	Orange	C.A. (±1) 1½ Digit	.99
MAN 6640	.560	Orange	C.C. (RHDP) 2 Digit	.99
MAN 6650	.560	Orange	C.C. (±1) 1½ Digit	.99
MAN 6660	.560	Orange	C.A. (RHDP)	.99
MAN 6710	.560	Red	C.A. (RHDP) 2 Digit	.99
MAN 6740	.560	Red	C.C. (RHDP) 2 Digit	.99
MAN 6750	.560	Red	C.C. (±1) 1½ Digit	.99
DL 34M	.110	Red	C.C. (4 Digit Bubble) RHDP	.49
DLO 304	.300	Orange	C.C. (RHDP)	1.25
DLO 307	.300	Orange	C.A. (LHDP)	1.25
DLG 500	.500	Green	C.C. (RHDP)	1.25
DLG 507	.500	Green	C.A. (RHDP)	1.25
DL 704	.300	Red	C.C. (RHDP)	1.25
DL 707	.300	Red	C.A. (LHDP)	1.25
DL 747	.630	Red	C.A. (LHDP)	1.49
DL 750	.630	Red	C.C. (LHDP)	1.49
FND 350	.362	Red	C.A. (RHDP)	.75
FND 357	.362	Red	C.C. (RHDP) FND 359	.75
FND 500	.500	Red	C.C. (RHDP) FND 503	.99
FND 507	.500	Red	C.A. (RHDP) FND 510	.99
TIL 308	.270	Red	Numerical Display w/Logic	10.95
TIL 311	.270	Red	4x7 Hexadecimal w/Logic	10.95
5082-7300	.600	Red	4x7 Numeric (RHDP)	$22.00
5082-7302	.600	Red	4x7 Numeric (LHDP)	22.00
5082-7304	.600	Red	Over Flo (±1) for 5082-7300 ser.	19.95
5082-7340	.600	Red	4x7 Hexadecimal (0-9/A-F)	22.50
5082-7432	.110	Red	C.C. (2 Digit/3 Bubble)	.29
HDSP 3401	.800 20mm	Red	C.A. (RHDP)	1.50
HDSP 3403	.800 20mm	Red	C.C. (RHDP)	1.50
HDSP 3406	.800 20mm	Red	C.C. (RHDP) ±1 Over Flo	1.50

Many Other Displays Available — Send for New Catalog

OPTO-ISOLATORS

H11C3	SCR Output Opto-Isolators	$1.19
LIT 1	Single Chan 20% CTR, 2500V (MCT-2/4N25)	.69
4N28	Single Chan 10% CTR, 500V (Photo-Transistor)	.69
4N33	Single Chan 500% 1500V (Photo-Darlington)	1.25
MOC3010	Optically Isolated Triac Driver	1.25

LITRONIX-NATIONAL Stick Display Sale

LIMITED QUANTITY!

LED NUMERIC ARRAYS

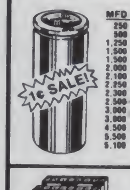
PART NO	DIGIT SIZE (RED)	FORMAT	DRIVE Comm Cathode/Comm Anode	OVERALL SIZE	PRICE	SALE PRICE!
NSA166	100 (9 Bubble Stick)	888888	C.C. 6 Digit Multiplexed	2"L x .72"H x .27"D	1.69	2/.99
NSA198	100 (9 Bubble Stick)	888888888	C.C. 9 Digit Multiplexed	2"L x .72"H x .27"D	.69	2/.99
NSA298	100 (9 Bubble Stick)	888888888	C.C. 8 Digit Multiplexed	1.98"L x .72"H x .27"D	.69	2/.99
NSA1160	100 (9 Bubble Stick)	8 88 88	C.C. 5 Digit Multiplexed	2"L x .72"H x .27"D	.49	2/.50

*Standard Stocked Items

MULTI-DIGIT LED NUMERIC DISPLAYS

PART NO	DIGIT SIZE (RED)	FORMAT	DRIVE	OVERALL SIZE	PRICE	SALE PRICE!
NSN373	.3 No Decimal	88	C.C. 2 Digit Direct	.80"L x .80"H x .225"D	1.69	2/.79
NSN374	.3 No Decimal	88	C.A. 2 Digit Direct	.80"L x .80"H x .225"D	.75	2/.99
NSN602	.5 No Decimal	88	C.A. 2 Digit Direct	1.40"L x 1.14"H x .32"D (7/16 pins)	.99	2/1.49
NSN781	.7	88	C.C. 2 Digit Multiplexed	1.2"L x 1.25"H x .3"D	1.19	2/1.95
NSB2100	.3	88*88-8888	C.C. 8 Digit (10 Spaces)	4"L x .80"H x .280"D	.75	2/.89
NSB3001	.3	8888	C.A. 4 Digit Multiplexed	1.50"L x .85"H x .25"D (7/16 pins)	.75	2/.89
NSB3382	.3	+:888	C.A. 3½ Digit Multiplexed	1.80"L x .80"H x .225"D	.99	2/1.49
NSB3411	.3	PM 88 88	C.C. 4 Digit – Colon/PM Indicator	1-9/16"L x 13/16"H x 3/16"D	.99	2/1.19
NSB3852	.3	°88 88 88	C.C. 9 Digit AM/PM Failure Ind	3"L x 1.10"H x 7/32"D	2.95	2/3.95
NSB3854	.3	888888888	C.C. 5 Digit Multiplexed	3"L x 1.3/32"H x 3/16"D	2.95	2/3.95
NSB3881*	.3	8888	C.C. 4 Digit Multiplexed	1.50"L x .80"H x .225"D	2.95	2/4.95
NSB3882*	.3	8888	C.A. 4 Digit Multiplexed	1.50"L x .80"H x .225"D	2.95	2/4.95
NSB5382*	.5	+:888	C.A. 3½ Digit Multiplexed	1.60"L x 1.00"H x .28"D	3.49	2/5.95
NSB5441	.5	°88 88	C.C. 4 Digit AM/PM, Colon Ind	3.00"L x 1.10"H x .282"D	2.95	2/3.95
NSB5881*	.5	8888	C.C. 4 Digit Multiplexed	1.90"L x 1.00"H x .280"D	3.49	2/5.95
NSB5882*	.5	8888	C.A. 4 Digit Multiplexed	1.90"L x 1.00"H x .280"D	3.49	2/5.95
NSB6016	.5	+8888	C.C. 3½ Digit Multiplexed	3.00"L x 1.10"H x .282"D	2.49	2/3.49
NSB5822	.5	88888	C.A. 5 Digit Multiplexed	3.00"L x 1.10"H x .282"D	2.95	2/3.49
NSB7923	.7	888888	C.C. 6 Digit Multiplexed/Direct	3.80"L x 1.36"H x .282"D (3 x pins)	3.95	2/4.95
DL2300	.3	88	C.C. 2 Digit Multiplexed	13/16" x 7/8" x 1/4	.79	2/.99
DLG2536	.5 (Green)	88	C.A. 2 Digit Multiplexed	1 5/16" x 1-1/2" x 5/16"	.89	2/1.19
DL3130	1.0	888	C.A. 3 Digit Multiplexed	2-3/4" x 1-13/16" x 5/16"	2.25	2/3.49
DL4500	.5	8888	C.C. 4 Digit MPX, Colon	3-3/16" x 1-1/4" x 5/16"	1.95	2/2.95
DL4507	.5	8888	C.C. 4 Digit, MPX, Colon	3-3/16" x 1 x 5/16"	1.79	2/2.95
DLG4507	.5 (Green)	8888	C.C. 4-Digit Non Multiplexed	3-3/16" x 1 x 5/16"	4.95	2/7.95
DL4509	.5	8888	C.C. 4 Digit Multiplexed	2" x 1-5/16" x 5/16"	1.49	2/1.95
DL4520A	.5	8888	C.C. 4 Digit Non Multiplexed	3-3/16" x 1" x 5/16"	2.49	2/2.95

COMPUTER GRADE CAPACITORS

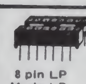


1¢ SALE 2 FOR THE PRICE OF ONE PLUS 1¢ MORE

MFD	WVDC	PRICE	MFD	WVDC	PRICE	MFD	WVDC	PRICE
250	150	1.95	7,000	50	4.95	27,000	10	2.95
500	200	2.49	19,000	15	2.95	32,500	25	4.95
1,250	3	.99	10,000	16	3.95	40,000	25	5.95
1,500	25	1.95	11,000	18	4.95	42,000	10	4.95
1,500	50	2.95	13,000	16	2.95	43,000	10	5.95
2,000	10	2.95	14,000	13	2.95	45,000	5	5.95
2,100	200	2.95	14,000	35	3.95	52,000	20	5.95
2,250	100	3.95	18,000	10	3.95	55,000	15	5.95
2,300	33	2.95	20,000	20	2.95	58,000	20	5.95
2,500	15	2.95	21,000	15	3.95	65,000	10	7.95
3,000	25	2.95	22,000	15	4.95	73,000	5	7.95
3,000	40	3.95	23,000	7	1.95	80,000	15	9.95
4,500	50	3.95	23,000	10	2.95	90,000	10	8.95
5,500	25	6.49	23,000	20	3.95	120,000	15	10.95
5,100	40	2.49	24,000	20	2.99	180,000	10	8.95

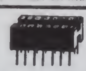
OVER 200 OTHER VALUES AVAILABLE — CALL OR WRITE FOR YOUR REQUIREMENT

LOW PROFILE (TIN) SOCKETS



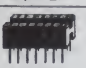
	1-24	25-49	50-100
8 pin LP	.17	.16	.15
14 pin LP	.20	.19	.18
16 pin LP	.22	.21	.20
18 pin LP	.29	.28	.27
20 pin LP	.34	.32	.30
22 pin LP	.37	.36	.35
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
36 pin LP	.60	.59	.58
40 pin LP	.63	.62	.61

SOLDERTAIL STANDARD (TIN)



	1-24	25-49	50-100
14 pin ST	.27	.25	.24
16 pin ST	.30	.27	.25
18 pin ST	.35	.32	.30
24 pin ST	.49	.45	.42
28 pin ST	.99	.90	.81
36 pin ST	1.39	1.26	1.15
40 pin ST	1.59	1.45	1.30

SOLDERTAIL (GOLD) STANDARD



	1-24	25-49	50-100
8 pin SG	.39	.35	.31
14 pin SG	.49	.45	.41
16 pin SG	.54	.49	.44
18 pin SG	.59	.53	.48
24 pin SG	.79	.75	.69
28 pin SG	1.10	1.00	.90
36 pin SG	1.65	1.40	1.26
40 pin SG	1.75	1.59	1.45

WIRE WRAP SOCKETS (GOLD) LEVEL #3

	1-24	25-49	50-100
8 pin WW	.59	.54	.49
10 pin WW	.69	.63	.58
14 pin WW	.79	.73	.67
16 pin WW	.85	.77	.70
18 pin WW	.99	.90	.81
20 pin WW	1.19	1.08	.99
22 pin WW	1.49	1.35	1.23
24 pin WW	1.39	1.26	1.14
28 pin WW	1.69	1.53	1.38
36 pin WW	2.19	1.99	1.79
40 pin WW	2.29	2.09	1.89

JUMPER AND CABLE ASSEMBLIES

STANDARD DIP JUMPERS

All jumpers use low profile dip plugs with heavy duty pins for repeated disconnect applications.

JAMECO Part No.	AP Cross-Reference	No. Pins	Description	Wire Length	Price
DJ14-1	924102-12	14	single end	12"	$1.79
DJ14-2	924102-24	14	single end	24"	2.05
DJ14-3	924102-36	14	single end	36"	2.35
DJ14-1-14	924106-12	14	double end	12"	3.20
DJ14-2-14	924106-24	14	double end	24"	3.49
DJ14-3-14	924106-36	14	double end	36"	3.79
DJ16-1	924112-12	16	single end	12"	1.85
DJ16-2	924112-24	16	single end	24"	2.10
DJ16-3	924112-36	16	single end	36"	2.59
DJ16-1-16	924116-12	16	double end	12"	3.35
DJ16-2-16	924116-24	16	double end	24"	3.69
DJ16-3-16	924116-36	16	double end	36"	4.05
DJ24-1	924122-12	24	single end	12"	2.69
DJ24-2	924122-24	24	single end	24"	3.39
DJ24-3	924122-36	24	single end	36"	3.95
DJ24-1-24	924126-12	24	double end	12"	4.79
DJ24-2-24	924126-24	24	double end	24"	5.29
DJ24-3-24	924126-36	24	double end	36"	5.89
DJ40-1	924132-12	40	single end	12"	5.89
DJ40-2	924132-24	40	single end	24"	6.79
DJ40-3	924132-36	40	single end	36"	7.69
DJ40-1-40	924136-12	40	double end	12"	10.95
DJ40-2-40	924136-24	40	double end	24"	11.89
DJ40-3-40	924136-36	40	double end	36"	12.79

STANDARD DB25 SERIES CABLES

Now you can order DB25 P or S connectors with the cable necessary to fit your application. Choose from our standard flat cable in 4 foot lengths.

STANDARD CABLES

Part No.	Cable Length	Connectors	Price
DB25P-4	4 feet	1-DB25P	$ 9.95 ea.
DB25S-4	4 feet	1-DB25S	10.95 ea.
DB25P-4-P	4 feet	2-DB25P	16.95 ea.
DB25P-4-S	4 feet	1 DB25P/1-DB25S	17.95 ea.
DB25S-4-S	4 feet	2-DB25S	18.95 ea.

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6% Sales Tax
Postage — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sale Flyer!

Spec Sheets — 25¢
Send 88¢ Postage for your
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INTERSIL

Part No.	Function	Price
7045IPI	CMOS Precision Timer	14.95
7045EV/Kit*	Stopwatch Chip, XTL	24.95
7106CPL	3½ Digit A/D (LCD Drive)	16.95
7106EV/Kit*	IC, Circuit Board, Display	34.95
7107CPL	3½ Digit A/D (LED Drive)	15.95
7107EV/Kit*	IC, Circuit Board, Display	29.95
7116CPL	3½ Digit A/D LCD Dis. HLD.	18.95
7117CPL	3½ Digit A/D LED Dis. HLD.	17.95
7201IDR	Low Battery Volt Indicator	2.25
7205IPG	CMOS LED Stopwatch/Timer	12.95
7205EV/Kit*	Stopwatch Chip, XTL	19.95
7206CJPE	Tone Generator	5.15
7206CEV/Kit*	Tone Generator Chip, XTL	12.95
7207AIPD	Oscillator Controller	6.50
7207AEV/Kit*	Freq. Counter Chip, XTL	13.95
7208IPI	Seven Decade Counter	17.95
7209IPA	Clock Generator	3.95
7215IPG	4 Func. CMOS Stopwatch CKT	13.95
7215EV/Kit*	4 Func. Stopwatch Chip, XTL	19.95
7216AIJI	8-Digit Univ. Counter C.A.	32.00
7216CIJI	8-Digit Freq. Counter C.A.	26.95
7216DIPI	8-Digit Freq. Counter C.C.	21.95
7217IJI	4-Digit LED Up/Down Counter CA	12.95
7217AIPI	4-Digit LED Up/Down Counter CC	14.95
7224IPL	LCD 4½ Digit Up Counter DRI	11.25
7226AIJL	8-Digit Univ. Counter	31.95
7226AEV/Kit*	5 Function Counter Chip, XTL	74.95
7240IJE	CMOS Bin Prog. Timer/Counter	4.95
7242IJA	CMOS Divide-by-256 RC Timer	2.05
7250IJE	CMOS BCD Prog. Timer/Counter	6.00
7260IJE	CMOS BCD Prog. Timer/Counter	5.25
7555IPA	CMOS 555 Timer (8 pin)	1.45
7556IPD	CMOS 556 Timer (14 pin)	2.20
7611BCPA	CMOS Op Amp Comparator 5MV	2.25
7612BCPA	CMOS Op Amp Ext. Cmvr. 5MV	2.95
7621BCPA	CMOS Dual Op Amp Comp. 5MV	3.95
7631CCPE	CMOS Tri Op Amp Comp. 10MV	5.35
7641CCPD	CMOS Quad Op Amp Comp. 10MV	7.50
7642CCPD	CMOS Quad Op Amp Comp. 10MV	7.50
7660CPA	Voltage Converter	2.95
8038CCPD	Waveform Generator	4.95
8048CCPE	Monolithic Logarithmic Amp	21.60
8069CCQ	50ppm Band—GAP Volt Ref. Diode	2.50
8211CPA	Volt Ref/Indicator	2.95
8212CPA	Volt Ref/Indicator	2.95

74C

74C00	.39	74C95	1.59	74C221	1.95
74C02	.39	74C107	1.89	74C240	2.25
74C04	.39	74C151	2.95	74C244	2.25
74C08	.39	74C154	3.95	74C373	2.49
74C10	.39	74C157	2.25	74C374	2.59
74C14	.75	74C160	1.69	74C901	.69
74C20	.39	74C161	1.60	74C903	.69
74C30	.39	74C162	1.49	74C911	10.95
74C42	1.39	74C163	1.69	74C912	10.95
74C48	1.95	74C164	1.59	74C915	1.69
74C73	.79	74C173	1.39	74C917	10.95
74C74	.79	74C174	1.39	74C922	5.49
74C85	1.95	74C175	1.19	74C923	5.75
74C86	.99	74C192	1.69	74C925	7.50
74C89	6.95	74C193	1.69	74C926	7.50
74C90	1.29	74C195	1.59	80C95	.79
74C93	1.29			80C97	.79

LINEAR

LH0002CN	6.85	LM340T-5	1.25	LM702H	.79
LM10CLH	4.50	LM340T-12	1.25	LM703CN	.89
LM11CLH	4.75	LM340T-15	1.25	LM709N	.29
LH0070-OH	4.95	LM341P-5	.75	LM710N	.79
TL071CP	.79	LM341P-12	.75	LM711N	.79
TL072CP	1.39	LM341P-15	.75	LM723N	.69
TL074CN	2.49	LM342P-5	.69	LM733N	1.00
LH0082CD	35.80	LM342P-12	.69	LM739N	1.19
TL082CP	1.19	LM342P-15	.69	LM741CN	.35
TL084CN	2.19	LM348N	1.25	MC1741SCG	3.00
LH0094CD	36.80	LM350K	5.75	LM747N	.79
LM300H	.99	LF351N	.60	LM748N	.59
LM301CN	.35	LF353N	1.00	LM1014N	2.75
LM302H	1.95	LF355N	1.10	LM1310N	1.95
LM304H	1.95	LF356N	1.10	LM1458CN	.59
LM305H	.99	LM358N	1.00	LM1488N	1.25
LM307CN	.45	LM359N	1.79	LM1489N	1.25
LM308CN	1.00	LM370N	4.49	LM1496N	1.95
LM309H	1.95	LM373N	3.25	LM1556V	1.75
LM309K	1.25	LM377N	2.95	LM1800N	2.95
LM310CN	1.75	LM380N	1.25	LM1871N	5.49
LM311/CN	.90	LM381N	1.95	LM1872N	5.49
LM312H	2.49	LM382N	1.79	LM1877N-9	3.25
LM317MP	1.15	LM384N	1.95	LM1889N	3.20
LM317T	1.75	LM386N-3	1.29	LM1896N	1.75
LM317K	3.95	LM387N	1.45	LM2002T	1.49
LM318CN	1.95	LM389N	1.35	LM2877P	2.05
LM319N	1.95	LM392N	.69	LM2878P	2.25
LM320K-5	1.35	LF398N	4.00	LM2896P-1	2.25
LM320K-12	1.35	LM399H	5.00	LM3189N	2.95
LM320K-15	1.35	TL494CN	4.49	LM3900N	.69
LM320T-5	1.25	TL496CP	1.75	LM3905CN	1.25
LM320T-12	1.25	NE510A	6.00	LM3909N	1.15
LM320T-15	1.25	NE529A	4.95	LM3914N	3.95
LM323K	5.95	NE531H	3.95	LM3915N	3.95
LM324N	.99	NE536H	6.00	LM3916N	3.95
LM329DZ	.65	NE540H	6.00	RC4136N	1.25
LM331N	3.95	NE544N	4.95	RC4151NB	3.95
LM334Z	1.30	NE550A	1.30	RC4194TK	6.95
LM335Z	1.40	NE555V	.39	RC4195TK	5.49
LM336Z	1.75	LM556N	.99	LM4500A	3.25
LM337T	1.95	NE564N	3.95	ICL8038B	4.95
LM337MP	1.15	LM565N	1.25	LM13080N	1.29
LM338K	6.95	LM566CN	1.95	LM13600N	1.49
LM339N	.99	LM567V	1.25	75138N	1.95
LM340K-5	1.35	NE570N	4.95	75450N	.89
LM340K-12	1.35			75451CN	.39
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47 pf	.08	.06	.05	.01µF	.08	.06	.05
100 pf	.08	.06	.05	.022µF	.09	.07	.06
220 pf	.08	.06	.05	.047µF	.09	.07	.06
470 pf	.08	.06	.05	.1µF	.15	.12	.10

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.001mf	.12	.10	.07	.022mf	.13	.11	.08
.0022mf	.12	.10	.07	.047mf	.21	.17	.13
.0047mf	.12	.10	.07	.1mf	.27	.23	.17
,01mf	.12	.10	.07	.22mf	.33	.27	.22

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.15/35V	.39	.34	.29	2.2/35V	.51	.45	.34
.22/35V	.39	.34	.29	3.3/25V	.53	.47	.37
.33/35V	.39	.34	.29	4.7/25V	.63	.56	.45
.47/35V	.39	.34	.29	6.8/25V	.79	.69	.55
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3.3/50V	.17	.15	.11	1.0/16V	.15	.13	.12
4.7/25V	.18	.15	.11	1.0/25V	.16	.14	.13
10/25V	.18	.15	.11	1.0/50V	.17	.15	.14
10/50V	.19	.16	.12	4.7/16V	.15	.13	.12
22/25V	.19	.16	.12	4.7/25V	.16	.14	.13
22/50V	.24	.20	.18	4.7/50V	.17	.15	.14
47/25V	.25	.21	.19	10/16V	.15	.13	.12
47/50V	.29	.25	.23	10/25V	.16	.14	.13
100/25V	.28	.24	.22	10/50V	.17	.15	.14
100/50V	.41	.37	.34	47/50V	.25	.21	.19
220/25V	.39	.34	.33	100/16V	.21	.17	.14
220/50V	.49	.45	.41	100/25V	.25	.23	.21
470/25V	.54	.49	.45	100/50V	.37	.34	.31
1000/16V	.79	.69	.61	220/16V	.25	.21	.19
2200/16V	.89	.79	.69	470/25V	.35	.31	.27

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7425	25	74107	25
7427	25	74152	40
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74LS10	24	74LS139	65
74LS11	33	74LS145	1.10
74LS12	33	74LS151	70
74LS13	45	74LS153	70
74LS14	89	74LS157	70
74LS20	24	74LS158	70
74LS21	24	74LS161	85
74LS26	30	74LS162	85
74LS27	28	74LS163	85
74LS28	32	74LS164	85
74LS30	24	74LS165	85
74LS32	32	74LS169	1.55
74LS37	50	74LS170	1.55
74LS38	32	74LS174	85
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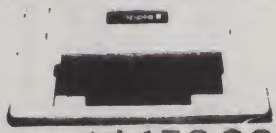

48k - $1450.00
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EXPLORER/85

Here's the low cost way to learn the fundamentals of computing; the all-important basics you'll need more and more as you advance in computer skills. For just $129.95 you get the advanced-design Explorer/85 motherboard, with all the features you need to learn how to write and use programs. And it can grow into a system that is a match for any personal computer on the market. Look at these features. *8085 Central Processing Unit*, the microprocessor "heart" of the Explorer/85. (Join the millions who will buy and use the 8080/8085 this year alone!) *Four 8-bit plus one 6-bit input/output ports* from which you can input and output your programs, as well as control exterior switches, relays, lights, etc. a cassette interface that lets you store and reload programs you've learned to write *deluxe 2,000 byte operating* system/monitor makes it easy to learn computing in several important ways • It allows simpler, faster writing and entering of programs • It permits access by you to all parts of the system so you can check on the status of any point in the program • It allows tracing each program step by step, with provision for displaying all the contents of the CPU (registers, flags, etc.) • and it does much more!

You get all this in the starting level (Level A) of the Explorer/85 for only **$129.95**. Incredible! To use, just plug in your 8VDC power supply and terminal or keyboard/display — if you don't have them, see our special offers below

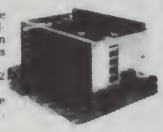
☐ Level A computer kit (Terminal Version) **$129.95** plus $3 P&I *

☐ Level A kit (Hex Keypad/Display Version) **$129.95** plus $3 P&I *

LEVEL B — This "building block" converts the motherboard into a two-slot S100 bus (industry standard) computer. Now you can plug in any of the hundreds of S100 cards available

☐ Level B kit **$49.95** plus $2 P&I *

☐ S100 bus connectors (two required) **$4.85** each, postpaid



LEVEL C — Add still more computing power: this "building block" mounts directly on the motherboard and expands the S100 bus to six slots

☐ Level C kit **$39.95** plus $2 P&I *

☐ S100 bus connectors (five required) **$4.85** each, postpaid

LEVEL D — When you reach the point in learning that requires more memory, we offer two choices: either add 4k of memory directly on the motherboard, or add 16k to 64k of memory by means of a single S100 card, our famous "JAWS."

Level D kit (CHECK ONE) ☐ 4k on-board **$49.95** plus $2 P&I*. ☐ 16k S100 "JAWS" **$149.95** plus $2 P&I*. ☐ 32k S100 "JAWS" **$199.95** plus $2 P&I*. ☐ 48k S100 "JAWS" **$249.95** plus $2 P&I* ☐ 64k S100 "JAWS" **$299.95** plus $2 P&I*

LEVEL E — An important "building block" it activates the 8k ROM/EPROM space on the motherboard. Now just plug in our 8k Microsoft BASIC or your own custom programs.

☐ Level E kit **$5.95** plus 50c P&I *

Microsoft BASIC — It's the language that allows you to talk English to your computer! It is available three ways

☐ 8k cassette version of Microsoft BASIC (requires Level B and 12k of RAM minimum; we suggest a 16k S100 "JAWS" — see above) **$64.95** postpaid

☐ 8k ROM version of Microsoft BASIC (requires Level B & Level E and 4k RAM; just plug into your Level E sockets. We suggest either the 4k Level D RAM expansion or a 16k S100 "JAWS.") **$99.95** plus $2 P&I *

☐ Disk version of Microsoft BASIC (requires Level B, 32k of RAM, floppy disk controller, 8" floppy disk drive) **$325** postpaid

TEXT EDITOR/ASSEMBLER — The editor/assembler is a software tool (a program) designed to simplify the task of writing programs. As your programs become longer and more complex, the assembler can save you many hours of programming time. This software includes an editor program that enters the programs you write, makes changes, and saves the programs on cassettes. The assembler performs the clerical task of translating symbolic code into the computer readable object code. The editor/assembler program is available either in cassette or a ROM version.

☐ Editor/Assembler (Cassette version; requires Level "B" and 8k (min.) of RAM — we suggest 16k "JAWS" — see above) **$59.95** plus $2 P&I *

☐ Editor/Assembler (ROM version; supplied on an S100 card; requires Level B and 4k RAM (min.) — we suggest either Level D or 16k "JAWS") **$99.95** plus $2 P&I *

8" FLOPPY DISK — A remarkable "building block." Add our 8" floppy disk when you need faster operation, more convenient program storage, perhaps a business application, and access to the literally thousands of programs and program languages available today. You simply plug them into your Explorer/85 disk system — it accepts all IBM-formatted CP/M® programs.

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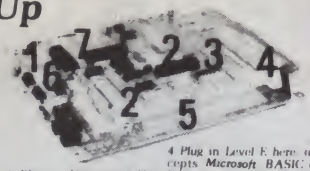
NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/85 (note: disk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below)

☐ AP-1 Power Supply kit (8V @ 5 amps) in deluxe steel cabinet **$39.95** plus $2 P&I *

NEED A TERMINAL? We offer you choices: the least expensive one is our Hex Keypad/Display kit that displays the information on a calculator-type screen. The other choice is our ASCII Keyboard/Computer Terminal kit, that can be used with either a CRT monitor or a TV set (if you have an RF modulator)



1. Plug in Netronics's Hex Keypad/Display
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3. Add 4k RAM
4. Plug in Level E here; accepts *Microsoft BASIC* or Editor/Assembler in ROM
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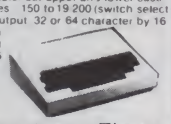
☐ Hex Keypad/Display kit **$69.95** plus $2 P&I *

☐ **FASTERM - 64 TERMINAL KIT** — Featuring a 56 key ASCII Keyboard; 128 character set upper and lower case; 75 ohm output; 8 baud rates (50 to 19,200 (switch selectable); RS232/C or 20 MA output; 32 or 64 character by 16 line formats, complete with Deluxe Steel Cabinet and Power Supply **$199.95** plus $3 P&I *



☐ RF Modulator kit (allows you to use your TV set as a monitor) **$8.95** postpaid

☐ 12" Video Monitor (10MHz bandwidth) **$139.95** plus $5 P&I *

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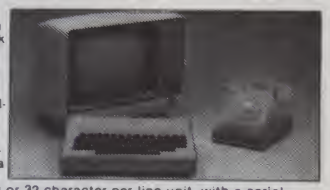

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Price breakthrough!!! Own the FASTERM-64, a complete terminal kit, ready to plug in for just $199.95 or order the SMARTERM-80 kit for just $299.95, (both available wired and tested.) Be on-line with the million-dollar computers and data services today . . . we even supply the necessary subscription forms.

More good news: All the components in our terminals are available separately (see coupon), so you buy only what you need!!!

FASTERM-64 . . . DISPLAY FORMAT: 64 or 32 characters/line by 16 lines . . . 96 displayable ASCII characters (upper & lower case) . . . 8 baud rates: 150, 300, 600, 1200, 2400, 4800, 9600, 19, 200, (switch sel.) . . . LINE OUTPUT: RS232/C or 20 ma current loop . . . VIDEO OUTPUT: 1V P/P (EIA RS-170) . . . CURSOR MODES: home & clear screen, erase to end of line, erase cursor line, cursor up & down, auto carriage return/line feed at end of line & auto scrolling . . . REVERSE VIDEO . . . BLINKING CURSOR . . . PARITY: off, even or odd . . . STOP BITS: 1, 1.5, 2 . . . DATA BITS PER CHARACTER: 5, 6, 7 or 8 . . . CHARACTER OUTPUT: 5 by 7 dot matrix in a 7 by 12 cell . . . PRINTER OUTPUT: prints all incoming data . . . 1K ON BOARD RAM . . . 2K ON BOARD ROM . . . CRYSTAL CONTROLLED . . . COMPLETE WITH POWER SUPPLY . . . OPTIONAL GRAPHICS MODE: includes 34 Greek & math characters plus 30 special graphics characters . . . ASCII ENCODED KEYBOARD: 56 key/128 characters.

SMARTERM-80 . . . DISPLAY FORMAT: 80 characters by 24 lines or 40 characters by 16 lines 128 displayable ASCII characters (upper & lower case) 8 baud rates: 110, 300, 600, 1200, 2400, 4800, 9600, 19, 200 . . . LINE OUTPUT: RS232/C or 20 ma current loop . . . VIDEO OUTPUT: 1V pp (EIA RS-170) . . . EDITING FEATURES: insert/delete line, insert/delete character, forward/back tab . . . LINE OR PAGE TRANSMIT . . . PAGE PRINT FUNCTION . . . CURSOR POSITIONING: up, down, right, left, plus absolute cursor positioning with read back . . . VISUAL ATTRIBUTES: underline, blink, reverse video, half intensity, & blank . . . GRAPHICS: 12,000 pixel resolution block plus line graphics . . . ON-SCREEN PARITY INDICATOR . . . PARITY: off, even or odd . . . STOP BITS: 110 baud 2, all others 1 . . . CHAR. OUTPUT: 7 by 11 character in a 9 by 12 block . . . PRINTER OUTPUT . . . 60 OR 50 Hz VERTICAL REFRESH . . . BLINKING BLOCK CURSOR . . . CRYSTAL CONTROLLED . . . 2K ON BOARD RAM . . . ASCII ENCODED KEYBOARD: 56 key/128 character . . . 4K ON BOARD ROM . . . COMPLETE WITH POWER SUPPLY

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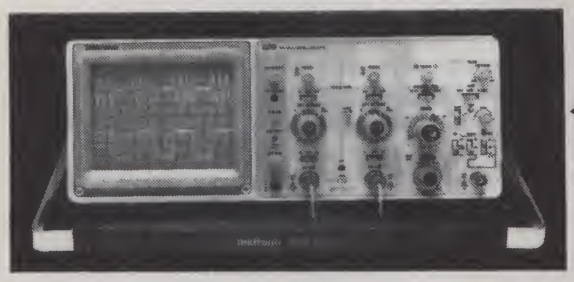

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PRICE	$1400.00	$1595.00	$1250.00	$795.00	$595.00
BANDWIDTH	60 MHz/50 MHz‡	100 MHz	50 MHz	35 MHz	20 MHz
SENSITIVITY	20 mV/DIV - 5mV/DIV‡	5mV/DIV	5mV/DIV	5mV/DIV	5mV/DIV
SWEEP SPEED SELECTION	50 ns/DIV to .5 s/DIV x 10 pull	20 ns/DIV to .5 s/DIV x 10 pull	50 ns/DIV to .5 s/DIV x 10 pull	.2 μ s/DIV to .2 s/DIV x 10 pull	.2 μ s/DIV to .2 s/DIV x 10 pull
VERTICAL MODES	CH 1, CH 2, ALT CHOP, ADD	CH 1, CH 2, ALT CHOP, ADD TRIG A VIEW TRIG B VIEW	CH 1, CH 2, ALT CHOP, ADD TRIG A VIEW	CH 1, CH 2 DUAL, ADD DIFF	CH 1, CH 2 DUAL, ADD DIFF
WIDE RANGE VERT. SENSITIVITY	2 mV to 100 V /DIV*	500 μ V to 50V /DIV†	1 mV to 50 V /DIV†	1 mV to 50 V /DIV†	1 mV to 50 V /DIV†
DELAYED OR INTENSIFIED SWEEP	YES	YES	YES	NO	NO
DELAY TIMES	.5 μ s to 4 ms	10 ns to 5 s/DIV	25 ns to 5 s/DIV	FIXED	———
DUAL TIME BASE MEASUREMENTS	A, B, ALT w/B INTENSIFIED	A, B, ALT w/B INTENSIFIED B INTENSIFIED	A, B, ALT w/B INTENSIFIED	——— ———	——— ———
TRIGGER "A" MODES	AUTOMATIC TV FIELD VERT MODE LINE EXTERNAL	AUTOMATIC TV VERTICAL TV HORIZONTAL LINE EXTERNAL SINGLE SWEEP	AUTOMATIC TV VERTICAL TV HORIZONTAL LINE EXTERNAL SINGLE SWEEP	AUTOMATIC TV (+, -) LINE EXTERNAL	AUTOMATIC TV (+, -) LINE EXTERNAL
TRIGGER "B" MODES	+, - SLOPE INTERNAL ONLY	+, - SLOPE INTERNAL EXTERNAL	+, - SLOPE INTERNAL EXTERNAL	———	———
SCALE ILLUMINATION	NONE	YES	YES	YES	YES
CHANNEL 2 INVERT	YES	YES	YES	NO	NO

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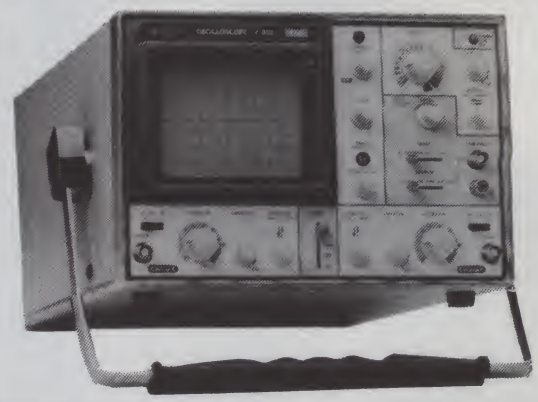

SPEC	TEK 2215	HITV1050B	HITV550B	HITV352	HITV202
TRIGGER VIEW	NONE	A, B	A	NONE	NONE
HF REJECTION	NONE	SWITCHABLE YES	SWITCHABLE YES	NONE	NONE
LF REJECTION	NONE	SWITCHABLE YES	SWITCHABLE YES	NONE	NONE
BAND WIDTH LIMIT	NONE	YES 20 MHz	NONE	NONE	NONE
X - Y MEASUREMENTS	YES	YES	YES	YES	YES
CAMERA BEZEL	YES	YES	YES	NO	NO
MULTI POSITION HANDLE	YES	YES	YES	YES	YES
JITTER	10,000:1	20,000:1	20,000:1	———	———
Z AXIS BANDWIDTH 0 - 5 Vpp	DC to 5 MHz	DC to 3.5 MHz	DC to 3.5 MHz	DC to 2 MHz	DC to 2 MHz
POWER CONSUMPTION	50 WATTS	60 WATTS	45 WATTS	45 WATTS	45 WATTS
PROBE CALIBRATOR	YES	YES	YES	YES	YES
MTBF	NOT GIVEN	20,00 HRS TARGET VALUE	20,000 HRS TARGET VALUE	20,000 HRS TARGET VALUE	20,000 HRS TARGET VALUE
A, B CHANNEL GATE OUTPUT	NO	YES	NO	NO	NO
POWER-ON INDICATOR	NO	YES	YES	YES	YES
WARRANTY	1 YEAR	2 YEARS	2 YEARS	2 YEARS	2 YEARS
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- ☐ 1. Apple
- ☐ 2. Atari
- ☐ 3. Heath
- ☐ 4. Hewlett-Packard
- ☐ 5. IBM
- ☐ 6. North Star
- ☐ 7. OSI
- ☐ 8. PET/CBM
- ☐ 9. SWTP
- ☐ 10. TRS-80
- ☐ 11. Other
- ☐ 12. Don't type any in

B. My computer use is:
- ☐ 1. Work-related only
- ☐ 2. Not related to my work
- ☐ 3. Both of the above
- ☐ 4. Don't use a computer

C. What is your position at work?
- ☐ 1. Owner
- ☐ 2. Associate
- ☐ 3. Partner
- ☐ 4. Manager
- ☐ 5. Other

D. How much money has your company spent on computer equipment this year?
- ☐ 1. Under $1,000
- ☐ 2. $1,000—$5,000
- ☐ 3. $5,001—$25,000
- ☐ 4. Over $25,000

E. Where do you purchase most of your computer equipment? Check one only.
- ☐ 1. Computer or electronics store
- ☐ 2. Department store
- ☐ 3. Mail order
- ☐ 4. Direct from manufacturer
- ☐ 5. Office equipment dealer

F. Would you buy a dump of the programs for your system printed in *Microcomputing*?
- ☐ 1. Yes—disk
- ☐ 2. Yes—cassette
- ☐ 3. No

G. What types of programs published in *Microcomputing* do you actually type in? Check up to 4 categories of most interest.
- ☐ 1. Business
- ☐ 2. Games
- ☐ 3. Utilities
- ☐ 4. Education
- ☐ 5. Graphics
- ☐ 6. Hobby
- ☐ 7. Home Finance/Management

H. Do you own a stringy floppy?
- ☐ 1. Yes
- ☐ 2. No, but plan to buy one
- ☐ 3. No, don't plan to buy one

I. In purchasing a system, which one of the following factors is most important to you? Check one only.
- ☐ 1. Price
- ☐ 2. Expandability
- ☐ 3. Service and maintenance
- ☐ 4. Software availability

J. For how long do you keep copies of *Microcomputing*?
- ☐ 1. Less than 1 year
- ☐ 2. 1-2 years
- ☐ 3. Over 2 years
- ☐ 4. Never throw/give away
- ☐ 5. Doesn't apply

K. How much time do you spend reading *Microcomputing*?
- ☐ 1. Less than 1 hour
- ☐ 2. 1-3 hours
- ☐ 3. 3-5 hours
- ☐ 4. More than 5 hours

L. On a scale of 0 (no interest) to 5 (most interest) rate your interest in the following specialized article themes:
- ___ 1. Education
- ___ 2. Hardware design
- ___ 3. Scientific
- ___ 4. Home use
- ___ 5. Graphics
- ___ 6. Games
- ___ 7. System-specific

M. Where do you obtain most of your information about computers? Check only one.
- ☐ 1. Computer magazines
- ☐ 2. Other magazines/newspapers
- ☐ 3. Books
- ☐ 4. Seminar or course
- ☐ 5. Other

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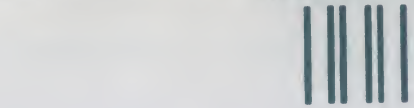

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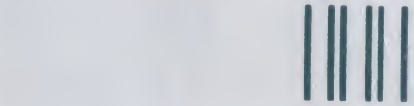

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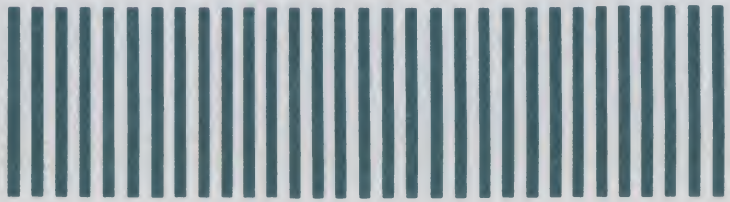

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BOOK REVIEWS

Edited by Lise Markus

A User Guide to the Unix System
Exploring the AIM 65
Executive Computing
Solving Problems with Pascal
Microsoft Fortran

A User Guide to the Unix System

Rebecca Thomas, Ph.D., and Jean Yates
Osborne/McGraw-Hill, 1982
630 Bancroft Way
Berkeley, CA 94710
Softcover, 508 pp., $15.95

A User Guide to the Unix System is a book designed to introduce a beginner to the powerful operating system Ken Thomson developed at Bell Labs in 1969.

The book starts out with a chapter on the history of Unix. Although the information in this chapter is not necessary for the operation of Unix, I found it to be a very interesting account of the background of Bell Labs, the Multics system, the C language and the Unix operating system. The chapter goes on to explain the organization of the Unix system programs, which include the kernel, the shell and the various utility programs. Also a chart is provided listing over 30 different computer applications with the corresponding Unix programs.

Since this is a beginner's book, the obligatory chapter on the basics of computer systems is included in chapter two.

"The best way to learn about the Unix system is to use it," is the opening of the next section of the book. In this vein, nine tutorials are presented, each meant to be completed at a session in front of a terminal. Before these tutorials begin, a review of some basic command syntax is covered and some of the basics of typing to the Unix system are reviewed. Each tutorial centers around a main topic, such as logging in and logging out, the file system, editing text, using the shell program or directory commands. The tutorials are presented well.

The purpose of these tutorials is not to provide a complete summary of all the details of a particular program, but to briefly give the reader a feel for what the program does in its simpler forms. Intermixed with text descriptions of how a program works are screens showing how the program will appear on a terminal. To avoid confusion, characters typed by the user appear in boldface while characters typed by Unix appear in regular type. This section of the book is an excellent way for the beginner to become aquainted with the Unix operating system.

Once you have gone through the tutorials of chapter three, you are ready to use the Unix system on an elementary level. However, you may find that you need more information on many of the Unix programs. Chapter four gives an in-depth discussion of 40 of the most commonly used system commands on Unix, as they are implemented in Version 7 Unix. Included in these discussions are examples of command use, switches that may be used with a particular command and error conditions that may occur with the use of that command. One troublesome area is the find command, used to locate files with certain specifications. The text failed to mention that the filename associated with the command should be enclosed within single-quote marks. This became evident only after studying the example screens. Usually no quotation marks are used to enclose Unix file names so the authors should have noted this in the description of the find command.

Other than the quotation problem, this chapter is quite useful as a reference section. The commands are grouped in the chapter according to their purpose. Since many of these Unix commands have rather obscure names, this grouping method is probably the best way to organize the chapter, although the more advanced user who remembers the command names, but not their syntax, might prefer a strictly alphabetical listing. This can be obtained from one of Bell Labs' hefty but useful reference manuals. There are many other commands and

MICRO QUIZ

Assembly Language Programming

If the following program is executed with input values of 5 and 6, what will be printed?

```
START   READ    A
        READ    C
        LOAD    A
        ADD     A
        ADD     A
        SUB     C
        STORE   TMP
        PRINT   TMP
        END
```

(answer on page 158)

↙See List of Advertisers on page 146

programs not included in this chapter, but to hold down the size of the book the authors wisely chose to limit their discussion to the 40 most commonly used commands.

The last three chapters provide a more generalized discussion on Unix. Chapter five covers "The Unix System and Office Automation," chapter six is "Evaluating and Accessing the System" and chapter seven is "The Unix System Resources." These chapters are especially useful for those contemplating the purchase of a Unix-based system. Included in chapter seven are the names and addresses of many vendors of Unix-related software and hardware.

The appendices include tables of Unix resources, a summary of Unix, an extensive bibliography, a glossary and a "Quick Reference to Unix System Commands." The quick reference pages are especially nice to have when the user needs to remember the syntax of a command, but does not want its full description. A complete index is also included after the appendices.

Overall, Rebecca Thomas and Jean Yates have produced an easy-to-read and understandable book. I recommend that anyone planning to use Unix obtain *A User Guide to the Unix System*.

John P. Keyes
Winchester, MA

Aim 65 Laboratory Manual and Study Guide

Leo J. Scanlon
John Wiley & Sons, Inc., 1981
605 Third Ave.
New York, NY 10158
Paperback, 179 pp., $7.95

The AIM 65 Laboratory Manual and Study Guide is an easy-to-use workbook which introduces you to the AIM 65 microcomputer and to some simple principles about programming a 6502 microprocessor. The manual depends heavily upon information presented in the Rockwell-supplied literature which accompanies the AIM 65 (*Aim 65 Microcomputer User's Guide, R6500 Programming Manual*, and *R6500 Hardware Manual*), and Scanlon's exercises and discussions reference these materials.

The book contains 17 sections, each introducing new programming concepts or features of the AIM 65. The sections can be roughly grouped into two categories: exercises dealing primarily with the AIM 65 hardware or ROM software, and those dealing primarily with 6502 programming concepts. All of the chapters contain exercises. The early exercises are simple enough for someone with no previous programming experience; later exercises are more complex. In order to ease the programming tasks the author introduces the use of specific subroutines available within the AIM monitor ROMs.

The information presented in the sections that deal specifically with the AIM 65 is mainly a repetition of material in the Rockwell manuals. However, Scanlon organizes the material and provides exercises to aid you in learning. For instance, the section on debugging describes those features of the AIM 65 which ease program debugging, and it guides the reader through a complete debugging exercise. Other sections present exercises on the use of the AIM 65's peripheral interface adapter (R6520) to control the AIM's 20-character display, and also on the use of the timers in the versatile interface adapter (R6522).

I found the final section of the workbook, devoted to the AIM Assembler/Editor, to be disappointing. This section adds little to the material in the Rockwell manuals and the exercise is not particularly helpful in demonstrating the power of this Assembler.

The remaining sections of the laboratory manual deal primarily with 6502 programming concepts. These sections contain problems in addition, subtraction, multiplication and division, and applied problems in sorting and code conversion. With some minor exceptions,

this material is presented clearly, and the problems are useful. One drawback I noticed is that while most of the exercises require flowcharting, this manual doesn't explain flowcharts.

For the novice programmer, the *AIM 65 Laboratory Manual and Study Guide*, together with the Rockwell manuals, provides a good initial exposure to the AIM 65 and to machine/assembly-language programming. Scanlon's major accomplishments in this book are in structuring the information provided in the AIM manuals and in integrating use of the AIM 65 with an introduction to machine/assembly-language programming.

The Take AIM Manual, Vol. I

James H. Clark
Matrix Publishers, Inc., 1981
Paperback, 387 pp.

This book is primarily a compilation of reference material for the Rockwell AIM 65 microcomputer. It will be of most benefit to those who are new to microprocessors and wish to learn to use the AIM 65. Chapters include information about computers in general, about the hardware characteristics of the AIM 65, and about the AIM 65 ROM software (monitor, editor and assembler). Higher level languages such as Basic, Forth, PL/65 and Pascal are not discussed in this book, although these languages are available for the AIM 65. Some fundamental concepts about microcomputers are discussed in detail—random access memory (RAM), memory mapping and the clock signal dependencies of microprocessors for example. A glossary of technical terms is included for those new to computers, and a set of study questions is provided in an appendix. Much basic material about computers is not discussed, however, so that this text would not be sufficient as the sole text in a course on microcomputing.

The *Take AIM Manual* contains two chapters which provide detailed references to the documentation supplied by Rockwell for the AIM 65. An index of Rockwell's source listings of the AIM monitor is included, as is a compilation of monitor subroutine entry addresses and their functions.

Chapter six is perhaps one of the most useful chapters in this text. Here Clark provides a much needed index of the AIM manuals supplied by Rockwell. This section would be easier to use, however, if it had appeared at the end of the book where it could be easily found, instead of at the center.

Hardware and software details concerning the AIM 20-character LED display, keyboard and versatile interface adapter (VIA) are each presented in individual chapters. These sections are reasonably detailed and are clearly written. Numerous programming examples accompany the discussions of the display and keyboard, although such examples are lacking from the section on the VIA.

Following the formal presentation of material in the first ten chapters, the latter half of the *Take AIM Manual* is a compilation of programs for the AIM 65. These include ten games and 20 utility programs. The programs are presented in several forms: object-code dump, formatted hex dump (using one of the utility programs), disassembler listing and text-editor source file listing. Most of these include a flowchart, and many of the text-editor source listings are annotated to document program operation.

My overall impression of this text is favorable. It contains much information that will be useful to a new user of the AIM 65, although the experienced user may find the presentation of material limited. Many readers will find the generally casual writing style of the author easy to follow. A major complaint with this text is that while it contains an excellent index of the Rockwell manuals, it does not contain an index of itself.

Larry P. Gonzalez
Chicago, IL

See List of Advertisers on page 146

The Index

W.H. Wallace
Missouri Indexing, Inc., 1981
PO Box 301
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Paperback, 489 pp., $14.95

Have you ever needed a list of magazine articles for a project you wanted to build or to do a research project for school or work? If you don't have a photographic memory and a king-sized library nearby, you might like a copy of *The Index*.

This inch-thick paperback is a very good place to start looking for articles on any subject in the popular microcomputing field. It is a cross-reference listing of microcomputing articles sorted by title, keywords in the title, computer system and operating system. The bibliography of 44 magazines indicates that most are covered from their first issue until midsummer of 1981.

The references are divided into sections for each of the major computer systems on the market today, as well as several other useful categories. The systems sections are Apple, Atari, North Star, Ohio Scientific, PET, Southwest Technical Products and the TRS-80. Other sections are for CP/M, the S-100 bus, the Z-80, 6502, 6800 and 8080 microprocessors.

The last section of the book is called General Articles and is a listing of all the articles in the previous sections sorted by title and keywords in the title.

The bibliography includes the complete address of each publisher, annual subscription price and the cost of back issues, if available. Two sources of reprints, one in the U.S. and the other in England, are also given.

The Index is clearly printed on quality stock. It will be of use to anyone who writes or needs to research any topic covered in microcomputing publications. I highly recommend it.

James M. Hansen
New Boston, NH

Executive Computing: How To Get It Done on Your Own

John M. Nevison
Addison-Wesley, 1981
Reading, MA 01867
Paperback, 225 pp., $8.95

This book fills an important need in the realm of microcomputers. There is plenty of material available for hobbyists who want to enjoy their computers a little more, and plenty for computerists who are interested in almost any aspect of computing machinery or programming. But there is little plain talk around for people who are interested mainly in applications—that is, in using a computer to do a specific job.

Nevison has not written a perfect book for this purpose, but he has provided a very readable and approachable introduction to desktop computers for the businessperson.

Executive Computing uses the Basic language, mainly because of its universality among small computers. But this book is not an introduction to Basic. It assumes the reader has already written and run at least a few programs. From this level of experience, Nevison takes us through more than two dozen specific cases in which people learn to use simple computer programs to help them with ordinary types of business applications such as calculating new values given growth or inflation factors; projecting an income statement; graphing sales figures; tracking cash flow; analyzing the profit contribution of each item in a product line; assessing the risk of various future possibilities; simple critical path evaluations; monitoring inventory; doing simple decision analysis; and even a program to schedule meetings among busy people.

The cases are organized around a few central characters who appear over and over. This technique gives the book a very folksy, friendly appeal that I feel is important in demystifying computers for businesspeople. In addition, a very comprehensive set of utility program listings in Appendix B shows the reader how to set up such functions as: reading DATA statements and counting the inputs, calculating percentages of a total, finding the maximum value in a list of values, sorting the values, plotting the values, printing a histogram of value distributions, drawing a pie or bar chart, printing amortization tables, printing depreciation tables, data smoothing and stock market beta (or risk) calculations.

Nevison's stated intention is for the individual routines to be translated into subroutines to use in larger, more complex programs. This is part of his theme —that you can very easily learn to program for business applications by using structured programming techniques, controlled variable inputs and outputs and simple algorithms.

Nevison paints a very rosy picture of how easy it is to write business programs. His cases all begin with a very clear task to be accomplished. However, in most business situations, people rarely start off knowing exactly what they want to accomplish.

But let's assume the task eventually will be defined. In Nevison's book, people always have time to sit down and immediately start programming the solution. Furthermore, no one in the book ever has any shortage of ideas, any question about how to accomplish a particular purpose, ever makes a typographical error or gets tired. In fact, throughout this book—which purports to be about programming—there is very little mention either of keystroke tedium or debugging, both of which are very big obstacles to programming a computer on your own.

One could say these are omitted because the reader, who should have already written and run several programs, knows them only too well. But I am a qualified reader, and I felt put off by the rose-colored glasses that Nevison, and all of his case characters, seem to wear. It bothered me that implementing Nevison's programs is a lot more difficult than he led me to believe. The result: frustration, incomplete projects and a quick desire to end my experiments with his programs.

Another problem with the book is Nevison's reluctance to use input commands in his programs. Almost invariably, the data is stored in program lines to be read during execution. I found this awkward, tiresome and an invitation to error. Given Nevison's listings, the only way to change any data is to key in a whole new DATA statement. In trying to work with some of Nevison's programs, I found myself growing very tired of keying new data into program lines for every iteration.

Most of the programs people use today are much more user friendly than Nevison's listings. VisiCalc is a perfect example. Nevison mentions VisiCalc quite briefly, and suggests that some of his listings can be implemented on the spreadsheet, if desired. Almost everyone will want to, because VisiCalc is much easier to use and more interactive than the programs Nevison is giving us. Businesspeople easily understand how VisiCalc works, and many are able to construct complex VisiCalc models within a few hours—far faster than they could learn to do the same work in Basic.

Nevison briefly argues that simplified programming is a good way to keep control of the computer, to use it as a tool rather than to let it take over and make your decisions for you. But commercial programs for small computers are more likely to be useful than these listings because they are more likely to be easier on the user. They commonly make extensive use of data stored on disk, for example, and of subroutines to prompt for changes to that data. Nevison's insistence on using DATA statements for information creates even more trouble when you discard the examples and try to apply the program to a real situation, which normally has reams of data to be processed. You wind up keying in long streams of numbers without labels, where any error is hard to find.

This is a strange programming practice for a man who seems to be advocating that businesspeople make more extensive use of small computers because they are so easy to work with. If Nevison had added a file management subsystem and input statements to his programs, they could quite easily allow for disk storage of data and selective changes of the

↙See List of Advertisers on page 146

data for each run. Such subroutines belong in his program listings and among his utilities.

All in all, Nevison has written a good book that demystifies computers for businesspeople, and I think it's worth reading. But this book is only the first stop on the journey businesspeople are making toward computer literacy and computer-aided decision systems.

Robert Moskowitz
Canoga Park, CA

Problem Solving and Structured Programming In Pascal

Elliot B. Koffman
Addison-Wesley, 1981
Reading, MA 01867
Paperback, 430 pp., $13.95

Pascal was conceived as a language that would help students learn computer programming without simultaneously learning bad techniques and habits that decrease efficiency. The idea was to introduce a student to a programming language that was logical and easy to document, and that automatically imposed systematic structure to the solution of a problem. Student programmers would thus always carry over the good techniques of Pascal when they learned a second computer language. The popularity of the desktop computer, however, almost guarantees that will not happen.

People owning microcomputers have already been infected with Basic. This tends to make Pascal programs look unnecessarily complicated and mysterious. Only brave souls will seek out another language. However, if you decide to tackle another language, Koffman's book is a good place to begin because of the emphasis on problem analysis and the large number (over 30) of complete example programs. Although this is a university text book, if you have a patient friend who can help you over the rough spots it might make an acceptable self-study course.

The introductory chapter seems slow as it names the parts of a computer and devotes a whole page to keypunch machines, but stick with it. By page 20 you'll have seen the first five Pascal statements and a simple payroll program. As additional statements are introduced in other chapters, the payroll program is improved. Each new Pascal statement is enclosed in a box with the syntax and a brief interpretation to separate it from the text. Most chapters end with a helpful discussion of common programming errors.

Learning Pascal is a waste of time if all you learn is how to make Pascal programs run. Instead of teaching Pascal, Koffman uses it to teach how to use a computer to solve problems. A typical student of Basic begins a problem by coding Basic statements and making trial run after trial run until the problem is solved. This is similar to building a house without blueprints. In each chapter, Koffman demonstrates that the coding should be done last, after the problem has been solved.

He does this without a single flowchart. Program development begins with a list of the information that must be calculated and displayed by the computer. This is called a data table. The data table becomes a valuable piece of program documentation because it contains the variable name assignments. The problem is now written as a list of steps that describe what will be done with the data. This is called an algorithm. At first, it is just a general outline of the problem solution but it must be sufficient to decide if the data table is complete. When the data table is correct, the algorithm is further refined by dividing steps into substeps. The refinement process continues until you can look at each substep and immediately know how to code it in Pascal.

In order to make sure that you can produce readable source code, Koffman spreads 34 style hints throughout the book. A Pascal programmer is free to use

blank spaces to improve the appearance of a program and to help make it easy to understand but a novice needs to learn where this would be useful. The style hints supply these ideas and also teach techniques of defensive programming (what to do if the user requests a negative number of widgets) and efficient programming (tradeoffs of value vs variable parameters).

You will appreciate the space the author takes in presenting each of the example programs. Designing a program to process checks and deposit slips, for example, carries on for ten pages. Most people will need to read those pages many times but each repeat will give more insight into top-down design.

If you can master the first eight chapters of this book you should be able to tackle a small Pascal project. The last three chapters deal with advanced file handling and they can be delayed until you feel good about the rest of Pascal.

The book does not expect the reader to have much computer programming experience. That's why it's so long. Perhaps that is also its biggest weakness; there is a lot to read.

Problem Solving is adequately organized but I would have preferred that all loop control statements be introduced in the same chapter. In addition, some readers may be perturbed to find there is no page with a list of Pascal statements. Instead, you must search through the syntax diagrams in the appendix.

If you feel that you will never write computer programs that exceed 20 lines of code then Pascal is not necessary. Even if your friend tries to convert you to Pascal with the religious fervor of a supply-side economist you can tell him that Basic is still the best language for short programs. If, however, you are dreaming of writing an arcade game or a system of programs for a special business, Pascal and structured programming have definite advantages. Koffman's book is then worth the price.

Mike Aronson
Oregon City, OR

Microsoft Fortran

Paul M. Chirlian
dilithium Press, 1981
PO Box 606
Beaverton, OR 97075
Paperback, 325 pp., $15.95

Microsoft Fortran is exceptionally well-suited for use on microcomputers using CP/M and others of the 8080/8085/Z-80 family. The book, *Microsoft Fortran*, is intended for readers who have had no experience with either Fortran or any other programming language. It discusses the language in enough detail that even an advanced programmer should need no other reference.

Chapter one is an introduction to computer programming in general and Fortran programming in particular. Before the end of the chapter the reader should be writing simple programs. Some of the topics covered in other chapters include arithmetic operations, control statements, algorithms, flowcharts, structured programming, documentation, looping techniques, subscripted variables, multidimensional arrays, logical variables and manipulation of alphanumeric characters.

An excellent tutorial on debugging is presented in chapter 14 and the last chapter discusses storage and retrieval of data, including sequential and direct access disk files. A glossary of Microsoft Fortran is provided in Appendix A, and Microsoft Fortran library functions are listed in Appendix B.

Microsoft Fortran is an excellent book. The beginner can learn not only how to write Fortran but a great deal about the philosophy of programming that will ease the way in learning other programming languages. The advanced programmer will find it an invaluable refresher and ready reference.

Alfred A. Adler
Tucson, AZ

↙See List of Advertisers on page 146

CALENDAR

PerCompAsia 82

The first Southeast Asian personal computer hardware and software show will be held October 20–23 at the Hyatt Convention Center in Singapore.

For further information contact Overseas Exhibition Services Ltd., 11 Manchester Square, London, W1M 5AB, England. Telephone: 01-486 1951, Telex: 24591 Montex.

The Fifth Annual Personal Computer World Show

The fifth annual Personal Computer World Show will be held at Barbican Centre, London, England, Sept. 9–12 and will include a wide range of exhibits oriented toward the business, scientific, educational and hobbyist markets.

For more information contact Tim Collins, Montbuild Ltd., 11 Manchester Square, London W1M 5AB. Telephone: 01-486 1951, Telex: 24591, Montex G.

Computer Camp, Inc.

Computer Camp, Inc. will hold five two-week sessions this summer at each of their three campsites—Santa Barbara, CA, Cape Cod, MA, and Lake Tahoe, CA. Campers will have an opportunity to learn Basic, the principles of electronics, advanced languages (Pascal, Fortran, assembly language and Lisp), artificial intelligence and robotics. In addition, recreational activities such as swimming, tennis, soccer, hiking and sailing will be offered. Youngsters ages 7–16 may attend. Each two-week session is $795.

Computer Camp, Inc. also offers week-long seminars for adults at the Club Med. resort in Ixtapa, Mexico and at the El Encanto Hotel, Santa Barbara, CA. These seminars focus on general microcomputer applications.

For further information contact Computer Camp Inc., 1235 Coast Village Rd., Suite G, Santa Barbara, CA 93108. 805-969-7871 or 800-235-6965.

Microcomputer Applications in Education—Univ. of Nevada

Microcomputer Applications in Education for teachers and administrators is a continuing education workshop sponsored by the University of Nevada-Reno Division of Continuing Education and the Washoe County School District. It will be held at Cloud's Cal-Neva, August 1–4.

For further information contact Shirley Beck, Division of Continuing Education, Reno, NV 89557. 702-784-4801.

Videotex '82

The Videotex '82 Conference will be held June 28–30 at the New York Hilton, New York City.

For information contact Online Conferences Ltd., Argyle House, Northwood Hills, HA6 1TS, Middlesex, England, United Kingdom. Northwood phone: (09274) 28211; international phone: 44-9274 28211; Telex: 923498; cable: Online Northwood.

Teknowledge

Teknowledge will offer two tutorials on applied artificial intelligence. Tutorial I, the Fundamentals of Knowledge Engineering, will acquaint participants with the fundamentals of knowledge engineering. Tutorial I is a week-long course.

Tutorial II is a six-week intensive course in artificial intelligence and will cover knowledge representation, reasoning, search, meta-level control and learning.

For further information contact Dina Barr, Director, Educational Services, 151 University Ave., Palo Alto, CA 94301. 415-326-6827.

Logo Courses

Logo, The Computer Learning Center, is offering courses and a computer day camp this summer. The camp and the courses are one week long and are offered ten times throughout the summer.

For more information contact Logo, The Computer Learning Center, 989 Avenue of the Americas, New York, NY 10018. 212-564-6020.

National Computer Graphics Association Conference

The third annual National Computer Graphics Association conference and exposition will be held June 13–17 in Anaheim, CA. Tutorials, technical sessions and exhibits make up the conference program.

For further information contact NCGA, 2033 M St. N.W., Suite 330, Washington, D.C. 20036, 202-466-5895.

Computerfest '82

The Midwest Affiliation of Computer Clubs is sponsoring the seventh annual Computerfest, June 18–20 at Franklin University, Columbus, OH. Computerfest will include lectures, demonstrations, exhibitions and a flea market.

For more information contact M.A.C.C., c/o Professor Don Moore, 201 South Grant Ave., Columbus, OH 43215.

Basic Training Camp

Lake Forest College will sponsor a series of one-week computer camp sessions from June 20–Aug. 6. The sessions are open to all youngsters 12 to 18 years old and will focus on the Basic language.

For more information contact Dr. Lowell Carmony, Associate Professor of Mathematics and Computer Studies, Lake Forest College, Lake Forest, IL 60045. 312-234-3100.

National Computer Camp

National Computer Camp will be held in Simsbury, CT from July 11–Aug. 16 for youngsters ages ten to 18. In addition to learning about computers, children will have an opportunity to enjoy recreational activities including swimming and tennis.

For more information contact Michael Zabinski, Ph.D., National Computer Camp, PO Box 624, Orange, CT 06477. 203-795-3049.

Welch Academy Computer Camp

Computer camp will be held at J. Hamilton Welch Academy, Ft. Myers, FL, June 14 to Aug. 13 for children ages 8 to 14. Out of town students will live with selected families of local students. The camp's emphasis will be on computers but recreation such as swimming, movies and music instruction will also be available. Cost is $125 per week or $500 per month and

includes tuition, room, board and all learning materials. The camp is fully accredited by the Southern Association of Colleges and Schools.

Write for details to Registrar, J. Hamilton Welch Academy, 3049 McGregor Blvd., Fort Myers, FL 33901. 813-334-6044.

Microcomputers in Education Conference

The second annual Microcomputers in Education Conference will be held on the University of Wisconsin-Madison campus. This conference is sponsored by the Wisconsin Center for Education Research and will highlight issues and activities about computers in educational settings. There will be no admission charge.

For details contact Dr. Janice Patterson, Wisconsin Center for Education Research, 1025 West Johnson Street, Madison, WI 53706.

Swapfest in St. Paul

The North Area Repeater Association will sponsor the state's largest swapfest and exposition of personal computer and communication equipment on June 5 at the Minnesota State Fairgrounds, located on Snelling Ave. north of I-94. Exhibits, booths and prizes. Admission $3.

For more information or reservations write Amateur Fair, PO Box 30054, St. Paul, MN 55175.

South Florida Microcomputer Conference

The South Florida Microcomputer Conference and Exhibition will be held at the OMNI Auditorium in Pompano Beach, FL, June 11–13.

This applications-oriented event is comprised of three major features: a trade show, a series of 30 low-cost seminars and a used-computer flea market.

Emphasis will be placed on small business use, word processing, education, science/engineering, and the consumer and hobbyist markets.

The show will run from 11 AM to 8 PM on Friday and Saturday, and from 10 AM to 6 PM on Sunday.

For further information, contact Tom Blayney or Tom Sattler at 305-483-5248.

New York Apple Fair

The Big Apple Users Group of New York will hold its third annual Apple Fair on Aug. 21 at the New York University campus (40 West Fourth St., NYU, Tisch Hall) from 10 AM to 5 PM. The theme of the fair will stress both business and leisure applications of Apple hardware and software. The event is free.

The program will include general business application classes and lectures on software (VisiCalc, plus various data management and word processing systems) as well as lectures and hands-on activities in the realm of graphics, games and education.

For more information contact Big Apple Users Group, PO Box 490, Bowling Green Station, New York, NY 10274. 914-636-3417.

MIT's Computer Music Courses

The Experimental Music Studio at the Massachusetts Institute of Technology will offer its sixth summer session from June 21 to July 30. The session consists of two complementary workshops. The first, Techniques of Computer Sound Synthesis (June 21–July 2), explores the latest developments in digital audio processing. The Workshop in Computer Music Composition (July 5–30), allows composers to use the computer as an expressive musical instrument. The courses are designed to provide participants with extensive hands-on experience using the studio's facilities. No special technical knowledge is required or assumed.

For more information, contact Director of the Summer Session, Room E19-356, Massachusetts Institute of Technology, Cambridge, MA 02139.

ACM-IEEE Fifteenth Annual Workshop on Microprogramming

The fifteenth annual workshop on microprogramming (MICRO-15) jointly sponsored by ACM, SIGMICRO and IEEE TC-MICRO will be held October 5–7, in Palo Alto, CA.

A tutorial covering current issues in firmware engineering will be presented on the preceding day, October 4, by Dr. Ted Lewis.

For more information contact Dr. Joseph Fisher, MICRO-15 Program Chairman, Yale University, Box 2158, Yale Station, New Haven, CT 06520.

Second International Computer Engineering Conference and Show

The Computer Engineering Division of the American Society of Mechanical Engineers (ASME) will hold the second International Computer Engineering Conference and Show at the Sheraton Harbor Island Hotel, San Diego, CA, August 15–19. Sixty panel and paper sessions covering the full spectrum of computer topics of interest to engineers are planned along with telecommunication events, poster sessions and student activities. A computer show will be conducted in conjunction with this conference in the exhibit hall adjacent to the conference area. A few of the technical sessions are: computer-aided

⌐See List of Advertisers on page 146

design, finite element techniques, computers in automotive industry, interactive graphics, computer-aided manufacturing, computers in education and computers in energy systems.

For further information contact Walter Mockert, ASME Headquarters, 345 E. 47th St., New York, NY 10017, 212-644-8032 or Dan Goetschel, Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics, Rensselaer Polytechnic Institute, Troy, NY 12181, 518-270-6471.

Hamcomp 82

The 1982 San Diego computer fair sponsored by the San Diego Computer Society will be held at the Town & Country Hotel, San Diego, CA, June 4–6. There will be technical sessions, exhibits and prizes.

For information contact Hamcomp, PO Box 81537, San Diego, CA 92138, or call Dr. Mel Zeddies at 714-274-4087.

MICRO QUIZ

(from page 148)

ANSWER: 9

This program calculates
A + A + A – C
where A is the first input value and C is the second.

The Computer: Extension of the Human Mind

The College of Education, University of Oregon, Eugene, OR, will hold its third annual summer conference, "The Computer: Extension of the Human Mind," July 21–23 at the Eugene Hilton Hotel and conference center. National leaders in the field of computer science and in computer manufacturing will explore the current state of computers in education and provide a glimpse of future trends. A variety of computers will be displayed and operated and group discussion sessions will be held.

Registration and program details may be obtained by writing '82 Summer Conference, Jude Ridge, College of Education, University of Oregon, Eugene, OR 97402. 503-686-3405.

Peripherals '82

The first International Peripheral Equipment and Software Exposition (Peripherals '82) will be held Sept. 29, 30 and Oct. 1 at the Anaheim Convention Center, Anaheim, CA.

For more information on exhibiting or visiting Peripherals '82 contact Cahners Exposition Group, 222 West Adams St., Chicago, IL 60606. 312-263-4866, Telex: 256148.

Origins '82

Origins '82, the eighth annual national Adventure Gaming show, will be held July 23–25 at the University of Maryland, Baltimore, MD. This gaming convention will include exhibitions, tournaments, seminars and demonstrations.

For more information contact Origins '82, PO Box 15405, Baltimore, MD 21220. 301-539-4634.

Attention: European Subscribers

Due to shipping problems in Europe, we are asking our subscribers to send us their most recent mailing label from *Microcomputing*. If you are unable to provide us with a label, please send us your name and address, and tell us at what point you are presently in in your subscription. This information is very necessary in order to solve a forwarding problem, so we are asking for your co-operation in this matter.

Please direct all information to: Attn: Doris Day, *Microcomputing*, 80 Pine Street, Peterborough, NH 03458.

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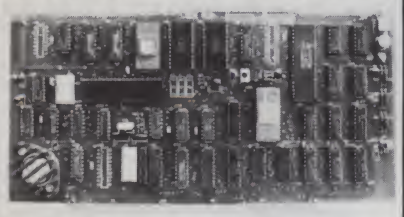

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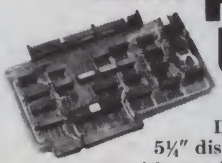

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NEW SOFTWARE

Edited by Linda Stephenson

Learn Pascal with Karel
Video Text Editor for CP/M and MP/M
General Ledger for the Osborne 1

Playing with Pascal

The Karel Simulator for Apple II+ implements a Pascal compiler/debugger environment in which to learn and explore programming. Students write programs that instruct Karel the robot to perform tasks in its world, which is represented as a grid of intersecting streets and avenues containing walls and beepers—objects that Karel can sense and manipulate.

Karel's programming language, which was designed to help teach the fundamentals of Pascal quickly, is documented in *Karel the Robot: A Gentle Introduction to the Art of Programming*, by Richard E. Pattis.

The simulator package includes a notebook containing a protected copy of the Karel Simulator, a preformatted utility disk, an instruction manual and a tutorial; price is $85. A special version is available for use on computer network servers. For teaching and/or self-instruction, a complete set of two course disks, containing all example programs from *Karel the Robot* and solutions to all problem sets, costs $150.

Cybertronics International, Inc., Software Publishing Division, 999 Mount Kemble Ave., Morristown, NJ 07960. Reader Service number 494.

Pascal Spooler For Apple II

Apple II Pascal users can retain full use of their machine while printing without any hardware modification or expensive peripherals. Sprinter works with any printer and interface. The program occupies less than 1K of user memory, and file size is not limited. Printing can be started anywhere in the text file. Price of Sprinter is $49.95.

Stellation Two, The Lobero Building, PO Box 2342, Santa Barbara, CA 93120. Reader Service number 493.

More with Less

Financial Statement Manager is a full-featured general ledger structured and sized to operate on the Osborne 1 computer. It will handle accounting requirements for small business, professional services or personal finances. The programs accommodate about 100 ledger accounts. Up to 650 transactions can be stored before a posting update makes disk space available for the next accounting cycle.

The programs feature trial balance and trial income statements, cash journal with descriptive audit trait and transaction detail printing during update runs. Account balances and totals are maintained for present month, quarter and year, as well as for the previous three quarters and the previous year. Operation and data entry are menu-driven, with checking for validity of account numbers, dates and other numeric ranges. Financial Statement Manager costs $99.

RSN Enterprises, 316½ Parkwood Drive, Grand Junction, CO 81503. Reader Service number 482.

War Game

Guns of Fort Defiance, a new software package from The Avalon Hill Game Company, 4517 Hartford Road, Baltimore, MD 21214, puts you in command of a Napoleonic era artillery piece and its crew. This game requires that you master the gunner's art to repel a series of graphic attacks by infantry, cavalry or artillery. You must instantly determine the type of ammunition appropriate for the target, the correct fuse length for shell or spherical case, the elevation adjustment corresponding to the range for direct or rolling fire and the deflection needed to put each shot where it will do the most harm.

The program comes on disk or cassette for Atari 800, Apple II, PET CBM and TRS-80 Models I and III. Price is $20. Reader Service number 492.

Full-Screen Text Editor

Micro Resources Corp., 6922 Harding Road, Suite 117-H, Nashville, TN 37221, announces a new video text editor for CP/M and MP/M users. MR EDit offers advanced features such as cursor movement by character, word, line and screen; horizontal scrolling for handling long lines; deletion by character, word or line in any direction; extensive search/replace abilities; and user-defined command keys. MR EDit will run on a 20K transient program area CP/M or MP/M system with a 12-line by 64-character display. Price is $90, on eight-inch single-density or 5¼-inch soft-sectored disk. Reader Service number 463.

Multiuser Operating System

A high-speed multiuser operating system that allows simultaneous running of both eight-bit and 16-bit applications programs, while providing 30 percent more available program area, was introduced by CompuPro Systems, Oakland Airport, CA 94614. MP/M 8-16 uses CompuPro's 8085/8088 CPU card. It features 62K bytes of user program space for eight-bit CP/M 2.2 compatible software. The new operating system runs any combination of CP/M 2.2 or CP/M 86 compatible software for as many as eight users. System price is $995. Reader Service number 499.

Bring Your H89 Into the Kitchen

Recipe-Master will index and select recipes from your files. The recipes are entered using any standard text editor. The Recipe-Master program provides several options: display, print, sort,

✓ See List of Advertisers on page 146

search or scan. Recipe-Master is available on 5¼-inch disk for Heath/Zenith H89 or H8/H19 computers. It costs $19.95.

Interactive Micro Systems, PO Box 21007, Columbus, OH 43221. Reader Service number 496.

Apple Flasher

Crow Ridge Associates, Inc., PO Box 90, New Scotland, NY 12127, announces software to locate and display standard Apple II high-resolution graphics files from DOS 3.3 disks. Apple Flasher bypasses ordinary DOS routines in order to display files as pictures in about 1.5 seconds each. Display modes include single-key selection of any file on disk, continuous scan of all files on disk with a new screen every 1.5 seconds, and carousel projector simulation controlled by either of the game controllers. Price is $34.50. Reader Service number 495.

File Compression

Equinox Data Systems, 973 Holmdel Road, Holmdel, NJ 07733, offers E-Pak, a software utility that lets users compress their files to 30–70 percent of their original size. E-Pak is available for most popular microcomputers. Price is $29.95. Reader Service number 497.

Project Specs

Compuspec is an office master specification software system for use by engineers and architects in preparing project specifications. The system uses CSI format and contains over 150 sections, consisting of more than 1000 pages of boiler plate (bidding requirements, contract forms, conditions of contract), Divisions 1–16, and an extensive collection of forms used throughout the course of a project. Compuspec works with Scripsit word processor. Automatic spelling proofreaders, subscriptions to regular updates, individual sections and divisions and other services are also available. The system is currently available for use on a TRS-80 Model II with daisywheel printer. Price of $2500 includes updates for one year.

Eberhard Engineering, 27 Pine Ridge Drive, Smithtown, NY 11787. Reader Service number 498.

Apple Word Processing

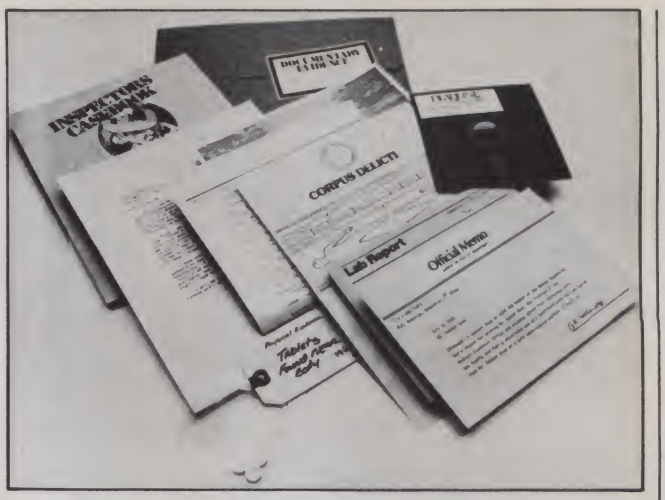
Super Text 40/80-column is now available from Muse Software, 347 N. Charles St., Baltimore, MD 21201. The program features the option to display an 80-column screen with the use of a Videx Board, and to insert page headers and footers. Most functions have been reduced to a single-key command. Also included are multifile search-and-replace, a display of disk space availability, a user-definable key that lets you insert up to 30 characters with a single keystroke and automatic counting of specific words or phrases in your files. Super Text also boasts an enhanced math mode, split screen option, advanced block operations and Autolink of multiple files. Super Text is priced at $175 for the Apple II or Apple II Plus. Reader Service number 491.

C Development Tools For the MC 6809

Introl-C is a set of software development tools for 6809-based C programs. Introl-C includes a C compiler, a 6809 assembler, an object code linker and an object code library manager. The source code for the complete standard runtime library is included. The compiler supports standard C control structures, arithmetic and logical operators and most forms of declarations. The only omissions from a full C implementation are long, floating and enumeration data types, initializers, bitfields and structures as function parameters.

The full Introl-C toolkit is available as a cross-compiler operating under CP/M, or as a resident compiler operating under Flex-09. The software is available on eight-inch CP/M or Flex compatible disks for $350 and $300, respectively.

Introl Corporation, 647 West Virginia St., Milwaukee, WI 53204. Reader Service number 486.



Infocom's Deadline comes in a dossier containing a lab report, fingerprints, physical evidence collected near the victim's body, interviews with possible suspects, an 8 × 10 glossy photo of the scene of the crime and a full-fledged detective manual.

Hires Plotting on Epson MX-80

Grafpac-80 brings high-resolution graphics to microcomputer users. Grafpac-80 gives high-level commands such as circle, ellipse, plot absolute and relative, move absolute and relative, pen up/down, character string plotting with rotation, size control, left or right justification and grid drawing, as well as 2-D and 3-D line drawing modes, to owners of x,y plotters or Epson MX-80s with Graftrax.

Several map, picture and math-function files are provided to demonstrate capabilities. Grafpac-80 is priced at $29.95 for TRS-DOS and $49.95 for CP/M.

M.E.S.C., Parkhurst Drive, Salisbury, MD 21801. Reader Service number 485.

Suspense and Treachery

A dead man, a locked door and a killer who may strike again. This dilemma challenges the detective/player in the first sophisticated murder mystery of the computer age. Deadline, a mystery game created by Infocom, Inc., 55 Wheeler St., Cambridge, MA 02138, comes packaged in a dossier containing critical evidence of the crime. Deadline is available for Apple II, Atari 400/800, IBM PC, NEC PC-8000 and CP/M-based machines. Reader Service number 490.

Office Help For Dentists

Charles Mann & Associates, Microcomputer Division, 55722 Santa Fe Trail, Yucca Valley, CA 92284, announces Dental Office Management I for the TRS-80 Models I and III. The package is designed for the single practitioner or small group practice. The system prepares daily appointment logs, daily cash journals and monthly patient bills. It also handles ADA claim form preparation, accounts receivable reporting and account collections activity. Price is $859.95. Reader Service number 488.

Duffers Take Note

Fore! This action-packed, strategic golf game from Au-

tomated Simulations, Inc., PO Box 4247, Mountain View, CA 94040, brings two complete 18-hole courses to your Apple screen. Now you can work on your game in any weather. There is a public and championship course, plus a driving range for pleasure and practice. The game features color graphics, with eight types of terrain. Ball trajectory is affected by wind direction and the player's choice of a full, normal or easy swing. Price is $29.95. Reader Service number 487.

For Smart Investors

The SMART Analysis and Graphics system is used by brokers, money managers, investment analysts, portfolio managers and individual investors to cut costs and maximize profit. SMART lets you quickly graph and analyze securities data on your Apple II computer; it's compatible with VisiCalc and other popular financial programs. The SMART program also communicates via modem with Software Resources' data service to provide you with instant access to a wide variety of market data. The price of SMART software starts at $1400.

Software Resources, Inc., 186 Alewife Brook Parkway, Suite 310, Cambridge, MA 02138. Reader Service number 489.

VIC-20 Graphics

Abacus Software, PO Box 7211, Grand Rapids, MI 49510, announces a versatile graphics package for the VIC-20 microcomputer. Graphvics gives the VIC user high-resolution and multicolor display modes. Graphvics provides two screens—one for normal text and the other for graphics display. On the graphics screen you have control over 24,000 individual points. Graphvics adds 18 commands to VIC Basic—commands to set colors, plot points, draw lines and rectangles, even display text on the graphics screen. The program runs on any VIC with a 3K or 8K expander. Price is $25, on cassette or disk. Reader Service number 483.

Household Help

Home Handy Hints is a new software program from Nancy Modney, 4144 N. Via Villas, Tucson, AZ 85719. This user-friendly menu-driven offering promises to teach you 50 unique ways to save time and money in the areas of energy, cooking, cleaning, child care and home maintenance. Just one idea out of the 50 tips might save you the price of the program. Home Handy Hints is available on cassette for the TRS-80 Models I and III for $14.83. Reader Service number 484.

Users of Software Resources' SMART software can generate bar charts, line charts, volume histograms and symbol charts with just a few key strokes.

See List of Advertisers on page 146

Edited by Linda Stephenson

Versatile Dot Matrix Printer
Dynabyte Business Computer
Atari Interface
Hard Disk for Xerox

Multimode Printer

The Model 7030 from the Qantex Division of North Atlantic Industries, 60 Plant Ave., Hauppauge, NY 11788, offers five user-selectable modes. This dot matrix printer operates at high speed for data processing and can also do letter-quality or graphics printing at slower speeds. All modes are switch-selectable and programmable. The Z-80 microprocessor-based printer contains a 2.7K-byte input buffer. At 37 cps, the vertical resolution is 144 dots/inch. Draft copy is printed at 180 cps and print-quality copy at 150 cps. Price is $1995. Reader Service number 468.

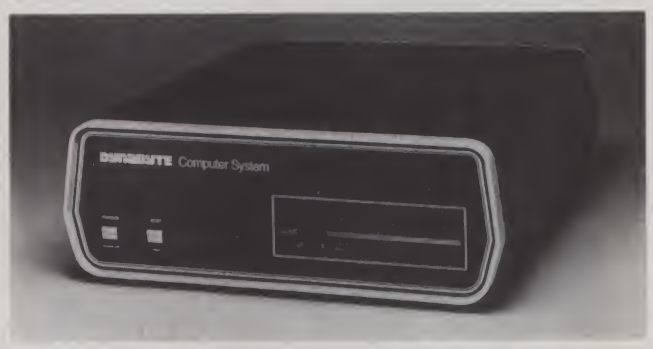
Talking Manual

Audio cassettes for first-time users of the IBM Personal Computer, Xerox 820, Heath/Zenith, Apple II Plus, Atari 800 and Osborne 1 are available from Micro Instructional, Inc., 6299 West Sunrise Blvd., Suite 205, Fort Lauderdale, FL 33313. These tapes take the user step-by-step through WordStar, Datastar, Supersort, Calcstar, Magic Wand, Executive Secretary and d-Base II. Most tapes are priced under $30. Reader Service number 474.

Increase Printer Efficiency

The Microfazer universal printer buffer can be used with all popular microcomputers and parallel printers. The parallel-in/parallel-out data buffer uses standard Centronics signals and can draw needed power from many different printers. Separate low-voltage power supply is available where required; standard calculator or battery chargers can be used. Microfazer receives data from the computer at up to 4000 cps. The data is then transferred to the printer as rapidly as the printer can handle it. The four models provide buffering of 8K, 16K, 32K or 64K; prices range from $159 to $299.

Quadram Corporation, 4357 Park Drive, Norcross, GA 30093. Reader Service number 464.



The Dynabyte Model 5605 system incorporates a hard disk and floppy drive in a single unit.

Multiuser Micro

A new microcomputer aimed at the small-business market has been introduced by Dynabyte, 521 Cottonwood Drive, Milpitas, CA 95035. It supports up to eight users and 16 printers, and provides up to 19M bytes of on-line storage. The 5605 combines a 5¼-inch hard disk with eight-inch floppy storage. The 5605 runs under CP/M, MP/M or the Oasis operating system. Languages include Basic, Cobol, Fortran, Pascal and PL/1. A variety of applications programs are available. The 5605-A1 with 6M bytes of hard disk capacity is priced at $7295; the 5605-B2 12M version sells for $7995 and the 5605-C2 19M version is $8995. Reader Service number 473.

The Qantex Model 7030 Multimode printer from North Atlantic Industries.

The Microfazer printer buffer from Quadram Corp.

JUDGE THE REST, THEN BUY THE BEST

Only GIMIX offers you **SOFTWARE SWITCHING** between **MICROWARE's OS-9** and **TSC's FLEX**. Plus you get the power of the GMXBUG system monitor with its advanced debugging utility, and memory manipulation routines. A wide variety of languages and other software is available for these two predominant 6809 Disk Operating Systems.

You can order a system to meet your needs, or select from the 6809 Systems featured below.

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GIMIX' CLASSY CHASSIS™ is a heavyweight aluminum mainframe cabinet with back panel cutouts to conveniently connect your terminals, printers, drives, monitors, etc. A 3 position keyswitch lets you lock out the reset switch. The power supply features a ferro-resonant constant voltage transformer that supplies 8V at 30 amps, + 15V at 5 amps, and − 15V at 5 amps to insure against problems caused by adverse power input conditions. It supplies power for all the boards in a fully loaded system plus two 5 ¼" drives (yes! even a Winchester) that can be installed in the cabinet. The Mother board has fifteen 50 pin and eight 30 pin slots to give you the most room for expansion of any SS50 system available. 11 standard baud rates from 75 to 38.4K are provided and the I/O section has its own extended addressing to permit the maximum memory address space to be used. The 2 Mhz 6809 CPU card has both a time of day clock with battery back-up and a 6840 programmable timer. It also contains 1K RAM, 4 PROM/ROM/RAM sockets, and provides for an optional 9511A or 9512 Arithmetic Processor. The RAM boards use high speed, low power STATIC memory that is fully compatible with any DMA technique. STATIC RAM requires no refresh timing, no wait states or clock stretching, and allows fast, reliable operation. The system includes a 2 port RS232 serial interface and cables. All GIMIX boards use gold plated bus connectors and are fully socketed. GIMIX designs, manufactures, and tests in-house its complete line of products. All boards are twice tested, and burned in electrically to insure reliability and freedom from infant mortality of component parts. All systems are assembled and then retested as a system after being configured to your specific order.

56KB 2MHZ 6809 SYSTEMS WITH GMXBUX/FLEX/OS-9 SOFTWARE SELECTABLE

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With #68 DMA double density disk controller **$3248.49**
to substitute Non-volatile CMOS RAM with battery back-up, add $150.00
for 50 Hz export power supply models, add 30.00

Either controller can be used with any combination of 5" and/or 8" drives, up to 4 drives total, have data recovery circuits (data separators), and are designed to fully meet the timing requirements of the controller I.C.s.

5 ¼" DRIVES INSTALLED IN THE ABOVE with all necessary cables

	SINGLE DENSITY		DOUBLE DENSITY		
	Formatted	Unformatted	Formatted	Unformatted	
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80 track (96TPI) single	404.480	500.000	728.064	1.000.000	2 for **900.00**
80 track (96TPI) double	808.960	1.000.000	1.456.128	2.000.000	2 for **1300.00**

Chart shows total capacity in Bytes for 2 drives.

Contact GIMIX for price and availability of 8" floppy disk drives and cabinets; and 5" and 8" Winchester hard disk system.

128KB 2Mhz 6809 DMA Systems for use with TSC's UNIFLEX or MICROWARES's OS-9 Level 2

(Software and drives not included) **$3798.39**
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for each additional 64KB NMOS STATIC RAM board, add $638.67
for each additional 64KB CMOS STATIC RAM board, add $798.64
for 50 Hz export power supply, add 30.00

NOTE: *UNIFLEX can not be used with 5" minifloppy drives.*

GIMIX has a wide variety of RAM, ROM, Serial and Parallel I/O, Video, Graphics, and other SS50 bus cards that can be added now or in the future. Phone or write for more complete information and brochure.

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GIMIX Systems are found on every continent, except Antarctica. (Any users there? If so, please contact GIMIX so we can change this.) A representative group of GIMIX users includes: **Government Research and Scientific Organizations** in Australia, Canada, U.K., and in the U.S.; NASA, Oak Ridge, White Plains, Fermilab, Argonne, Scripps, Sloan Kettering, Los Alamos National Labs, AURA. **Universities:** Carleton, Waterloo, Royal Military College, in Canada; Trier in Germany; and in the U.S.; Stanford, SUNY, Harvard, UCSD, Mississippi, Georgia Tech. **Industrial users** in Hong Kong, Malaysia, South Africa, Germany, Sweden, and in the U.S.; GTE, Becton Dickinson, American Hoechst, Monsanto, Allied, Honeywell, Perkin Elmer, Johnson Controls, Associated Press, Aydin, Newkirk Electric, Revere Sugar, HI-G/AMS Controls, Chevron. **Computer mainframe and peripheral manufacturers,** IBM, OKI, Computer Peripherals Inc., Qume, Floating Point Systems. **Software houses;** Microware, T.S.C., Lucidata, Norpak, Talbot, Stylo Systems, AAA, HHH, Frank Hogg Labs, Epstein Associates, Softwest, Dynasoft, Research Resources U.K., Microworks, Analog Systems, Computerized Business Systems.

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Hard disk memory is combined in a single enclosure with the CPU, video screen, floppy drive and keyboard in Eagle's two new products.

Eagle Hard Disk Systems

Two microcomputer systems featuring CP/M and integral hard disk storage are available from Eagle Computer, Inc., 501 Vandell Way, Campbell, CA 95008. The Eagle IV offers 7.5M bytes of formatted hard disk capacity and the Eagle V provides 15M; prices are $8995 and $9995 respectively. The Eagle systems include the Spellbinder word processing program and the eight-module Accounting Plus package. Reader Service number 478.

Teach Your Computer To Talk

Get on speaking terms with your computer. The Heathkit/Zenith Voice Synthesis Course, EE-3403, teaches you this state-of-the-art technique in an easy-to-follow format with hands-on experiments. The five-unit course consists of a 250-page text with experiments in voice synthesis, chip sets and other electronic components needed to perform the experiments. It teaches the programming and interfacing necessary for breadboarding digitized voice synthesis (fixed vocabulary with human voice qualities) and phoneme voice synthesis (which lets the user reproduce any English word). And it prepares the user to write machine-code programs tailored for the ET-3400 and ET-3400A trainers. The course is priced at $129.95; the Heathkit/Zenith ET-3400A microprocessor trainer is priced separately at $229.95.

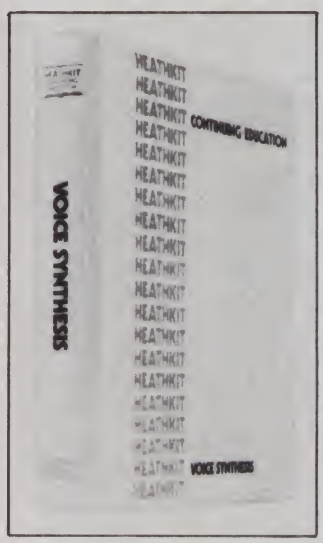
Heath Company, Benton Harbor, MI 49022. Reader Service number 470.

Local Networking

Micom's Micro400 local datasets offer data transmission flexibility and added support for dumb terminals. These modems operate over a wide range of speeds. The Model 401 asynchronous dataset transmits data up to eight miles at 1200 bps, or up to 2½ miles at 9600 bps, over four-wire private or leased metallic circuits. Price is $250. The Model 402 smart asynchronous dataset offers the Model 401's capabilities plus dial-up emulation, to replace low-speed dial-up modems without changing software or communications protocols. Price is $330. The Model 421 dataset is intended for high-speed synchronous operation; it transmits nine miles at 1200 bps or three miles at 19,200 bps. The Model 421 costs $370.

Micom Systems, Inc., 20151 Nordhoff St., Chatsworth, CA 91311. Reader Service number 467.

The Micro400 local networking dataset from Micom Systems.



The new Heathkit/Zenith Voice Synthesis Course teaches the two most popular techniques of voice synthesis.

Atari Interface

Intelligent interface modules from Compu-Mate, 6305 Arizona Ave., Los Angeles, CA 90045, enable the Atari 400/800 computer to do many additional personal and business jobs. The Model CM-1000 printer interface includes a standard synchronous serial port and an eight-bit parallel port. The unit includes a simple program with which users can tailor control codes for each port for use with many popular printers. Price is $289.

The CM-1000/V unit includes the CM-1000 printer interface and an 80-column video display generator for full-page word processing. Additional features include direct connection to the Atari video monitor ports, software-selectable 80- or 40-column display, full 96 ASCII character set, upper/lowercase characters with true descenders and reverse video. The CM-1000/V is priced at $489. Reader Service number 466.

The Compu-Mate interface module for Atari computers.

Hard Disk for Xerox

Rair Computer Corp., 4101 Burton Drive, Santa Clara, CA 95050, has announced a low-cost Winchester disk for the Xerox 820 Personal Computer. The 5-M byte disk drive provides more than 20 times the storage capacity of the standard Xerox 820 floppy disk drive. Loading and retrieval speeds are increased ten-fold, and average random access time is as low as 95 ms.

The Elite One from Rana Systems.

Rair's Model 505 Winchester disk drive for the Xerox 820 Personal Computer.

The unit is supplied with a host adapter and CP/M software driver for the Xerox 820, allowing simple "plug-in-and-go" operation. Price is $3500. Reader Service number 471.

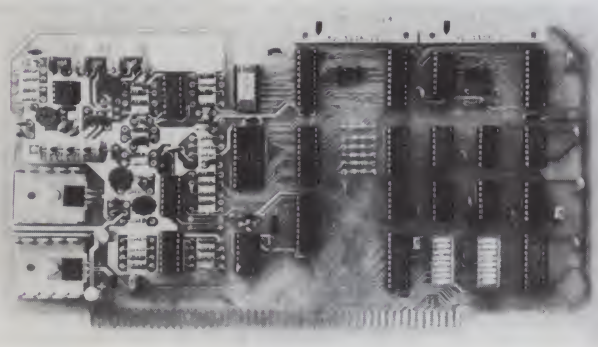
Apple-Compatible

A series of high-density single- and double-sided floppy disk subsystems for Apple II computers are available from Rana Systems, 20620 South Leapwood Ave., Carson, CA 90746. The company's base unit, The Elite One, provides 14 percent greater capacity than existing drives; higher-level units offer up to four times the capacity of comparable Apple drives. Price is $449. Reader Service number 476.

Sound Investment

The Synthetalker from Ackerman Digital Systems, Inc., 110 N. York Road, Suite 208, Elmhurst, IL 60128, is an IEEE 696/S-100-compatible board that provides speech, sound and I/O capability. Speech is generated with the phoneme-driven Votrax SC-01, which features 64 phonemes with four inflection levels and automatic phoneme timing. The Synthetalker provides for preset and software control over speech pitch.

Sounds can be created with the SC-01 phonemes, by waveform synthesis with the digital-to-analog converter, or both together. An external



The Synthetalker from Ackerman Digital Systems, Inc.

See List of Advertisers on page 146

Durango's 900 Series computer can serve up to five users.

The Fox, from Digital Microsystems, functions as a stand-alone computer or can be integrated into the HiNet network.

audio line-input into the mixer is also provided.

Included are two eight-bit I/O ports; two user-jumpered status/control lines, a program-controlled strobe line and two voltages are on each port. The bareboard costs $64.95; ADS kit is $279.95; assembled and tested board costs $310. Reader Service number 481.

TRS-80 Upgrade

An inexpensive 5M-byte hard disk is offered by Laredo Systems, 2264 Calle de Luna, Santa Clara, CA 95050. Users can partition the hard disk into one to four partitions. Host adapters for the TRS-80 Models I or III are priced at $250, and the hard-disk version of LDOS software is $160. Laredo's Model LS525 hard disk costs $1995. Reader Service number 469.

Superfast Micro

The 900 Series multiuser computer features an integrated Winchester disk for up to 15M bytes of on-line storage —roughly equivalent to 7000 pages of typewritten information. An auxiliary fixed disk can add another 7M or 14M. The 900 includes a keyboard and a 200 cps printer suitable for data processing. Price is $11,900. The 900XR's dual-mode printer can also perform high-resolution letter-quality printing, and this system is priced at $14,950.

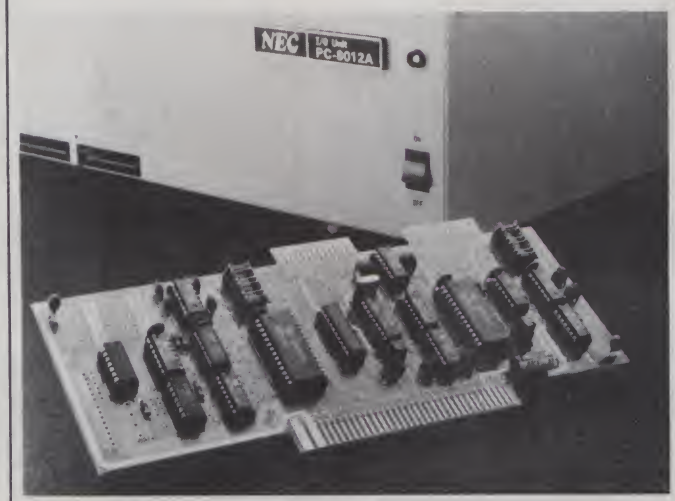
Durango Systems, 3003 N. First St., San Jose, CA 95134. Reader Service number 477.

Modular Micro

The Fox is a CP/M-based desk-top computer that functions as a 64K stand-alone system or a component in the company's HiNet local area network. The new DSC-3/F system brings together a Z-80A processor, a nine-inch CRT, two 5¼-inch single- or double-density, double-sided floppies, the network interface, four RS-232C serial ports and two eight-bit bidirectional parallel ports with status lines. Software for payroll, general ledger, accounts receivable and accounts payable are included with the system. Price is $3995.

Digital Microsystems, 1840 Embarcadero, Oakland, CA 94606. Reader Service number 479.

Laredo's LS 525 hard disk provides TRS-80 users with 5M of user memory.



This versatile communications board gives the NEC PC-8000 new possibilities.

NEC Communications

A new communications board for the NEC PC-8000 offers two standard RS-232C ports, software-selectable data transmission from 50 to 19,200 bps, and the option to address either data terminal or data communications equipment. The PC-8012A-COM1 board is priced at $250.

NEC Information Systems, Inc., 5 Militia Drive, Lexington, MA 02173. Reader Service number 472.

Debug

If you program or engineer microprocessor devices, you can debug quickly, completely and inexpensively with Micro View from Micro Logic Corp., PO Box 174, Hackensack, NJ 07602. It gives you a unique view of microprocessor activity on a screen of 256 LEDs, which show you extensive real-time information

✓See List of Advertisers on page 146

The Micro View debugging tool from Micro Logic Corp.

through changing patterns. Various modes let you select address or data, read and/or write, input/output or memory, detailed or overview modes, and specific pages of memory. The price is $995. Reader Service number 480.

More Atari Memory

An inexpensive upgrade is available for owners of the Atari 400 with 16K memory and Atari 800 with 16K or 32K. The Mosaic Expander RAM board, part #H216, adds 16K to the Atari computer. After the Atari user has exhausted the potential of a 16K board, upgrade to 32K is easy with the H212 upgrade kit priced at $60. Atari 400 owners can use their existing 16K RAM to upgrade to 32K for $120 total.

Mosaic Electronics, PO Box 748, Oregon City, OR 97045. Reader Service number 465.

Get It Together

U.S. Micro Sales, 15381 Chemical Lane, Huntington Beach, CA 92649, offers an integrated microcomputer cabinet that can be used as a base for a stand-alone system or for upgrading a breadboard set-up. The cabinet has space for two Shugart-compatible eight-inch disk drives or two five-inch drives; also included is space for the S1 mod 12-slot motherboard and power supply. Cutouts for eight RS-232 connectors, four ac receptacles and a cooling fan are provided. Price is $180. Reader Service number 475.

Microcomputing's New Product and New Software columns are compiled exclusively from manufacturers' press releases. Inclusion of a product does not imply our endorsement of that product.

U.S. Micro Sales' microcomputer system cabinet.

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SOFTWARE REVIEWS

(continued from page 178)

With the exception of carriage return marks and page break bars, on-screen text contains only characters typed there.

The program contains a full complement of the usual word processing program features. Some of the capabilities are surprisingly sophisticated. For example, mirror image margins and folded paper printing capabilities are included. On the other hand, a few features that one would expect in a $250 program are noticeably absent.

One of the most highly touted features of the Word Handler is simplicity of operation. The manual says that you should be able to do useful work with the program in 20 minutes. Control functions, display format and instructions are all oriented toward maximum simplicity and brevity.

Setting up the program to operate with your Apple is simply a matter of specifying slot and type of printer you have. This process is invoked automatically on first use or by pressing the space bar during subsequent bootings. Once set, you need only change the parameters if your hardware is modified in some way. Following each boot, you are asked to designate whether or not to use the 66-column compact format. The non-compact format may be necessary under some circumstances.

Once booting is complete and the format has been designated, the program enters an "idle" state from which all other functions may be selected. Typing "INDEX RTN", or just plain "RTN", displays a catalog of all documents on the disk. Entering the name of one of them brings it to the screen. If you type the name of a document not on the disk, options are presented to either create a file by that name or start over.

Document names may be up to 30 characters in length. If a semicolon appears in the name, only the characters preceding the semicolon need to be typed to call the document at a later time. All 30 characters appear in the index, however, allowing for some remarks to be included without requiring a lot of extra typing. Minor maybe, but a handy feature.

Inserting text (selected by CTRL-I) is a relatively painless process. If your Apple has never been modified for shift key operation, uppercase letters are produced by preceding them with ESC. My machine has been modified for another word processor, so the shift key is fully operational. The Word Handler should recognize any of the common modifications. In either case, CTRL-K functions as a shift lock.

You may type merrily along, as is the custom with most word processing programs, with utter disregard for such mundane things as line length and carriage returns. Words too long for one line will be moved to the next. Mistakes may be corrected with the back arrow and you aren't likely to type fast enough to get ahead of this program.

Although I am not the world's speediest typist, I have exceeded the input speed capability of at least one of my other word processing programs. Not so with this one. Carriage returns are used only to start typing on a new line, such as the beginning of a paragraph. A distinctive mark appears on the left margin wherever a carriage return has been used. A number inside the mark designates vertical spacing, which may be altered as desired only after you press the return key.

One of the nicest features of the Word Handler is the manner in which the display is handled. Aside from the status line on the bottom of the page (which indicates tab stops and current cursor position) and carriage return marks, all that appears on screen is what you put there. Each option selected changes the display to reflect its operation. Lines are justified on screen, text may be underlined, superscripted or printed in bold face. Insert is terminated by using the forward arrow key.

Deleting text (called by CTRL-D) lets you delete a character, word, line or page. All items to be deleted are shown in inverse video and must be verified prior to the delete actually taking place. Prior to pressing a control key to finalize it, you can cancel delete by pressing the back arrow key.

Cursor position is controlled by the forward and back arrow keys, which may be used in conjunction with CTRL-W (word), CTRL-L (line), CTRL-P (page) or RTN (next carriage return mark). Search operations will move forward or backward through the text to locate a specific word or phrase. Copy (CTRL-C) puts text into a temporary storage area on the disk. Stored text may be inserted at the desired location by typing CTRL-I, CTRL-C.

Copy and delete functions are provided for moving text from one location to another. CTRL-G is used to merge text from another document into the one currently on the screen. A fill-in capability to allow the use of form documents is included.

Page formats for printing are specified using CTRL-F. A versatile routine allows the user to specify all the usual parameters plus odd and even page headers/footers, mirror image margins or folded sheet printing. Specifying PRINT from the idle state prompts a request for the document name and the page numbers

(or range of page numbers) to be printed.

Disk utilization is a relatively automatic process. Files may be lengthy (117K), as opposed to some systems which restrict the file length to the amount of RAM available with the program booted. Provisions are included for multiple disk use or backup copying.

The compact format video display is quite readable on a monitor or high-quality black and white TV set. My monitor (a Zenith) handles normal text quite well, but boldface text is unrecognizable. Both normal and boldface are not much more than a blur on my Sony color set. Plan on using the non-compact format if you are not equipped with a monitor.

Documentation supplied with the program is written "to give maximum information in a minimum space." The goal is certainly worthy, but in many cases more questions are raised than answered. Those who have had some prior experience with word processing programs may be able to figure it out, but the rank beginner will have a real problem.

The program does have excellent on-screen prompting and disaster safeguards. Two areas not mentioned in the manual—error recovery procedures and disk replacement (warranty)—certainly should be considered in the next version. Although two copies of the program disk are included, I would like to know how to obtain a replacement if both of them went kaput.

The print routine requests both document name and page numbers or range of numbers. While the disk catalog shows the name, page numbers are not included. It would be helpful to have them displayed along with the document name. Adding a provision to print all the pages of a document, particularly since multiple copies are not supported, would be valuable. At the end of each printed page, the program asks you to align the paper and press space to continue. While that process is necessary for sheet-fed printers, it is a bit of a nuisance for those with tractor feed units.

There is no provision for dynamic formatting within the text, which is inconvenient when you are outlining and printing long quotes. While selection of vertical spacing and justification at each carriage return is handy, changing them within a completed document is unwieldy. Often I find myself printing a single spaced, justified file copy of a document for one application and a double spaced, ragged margin copy of the same document for another. Some sort of global replace for these two parameters would save a lot of extra work.

But the positive factors certainly outweigh these problems. The Word Handler is a very good Apple II word processing program with the potential to become outstanding. A minor modification or two, slightly more detailed documentation and a few added capabilities are all that's needed.

If you can live with the limitations mentioned earlier, it would be hard to come up with a better package for the money. I like the idea of being able to buy a sophisticated word processing system without having to spend a fortune on additional hardware.

(Silicon Valley Systems, 652 Bair Island Road, Redwood City, CA 94063. $249)

Leslie Schmeltz
Bettendorf, IA

Disk Doctor, Diagnostics II

The prescription for crashed CP/M disks

Crashed a vital disk? Nothing coming up but BDOS errors? And your backup disks are either hopelessly out-of-date, or worse yet, nonexistent?

Then it's time to call the doctor—the Disk Doctor. And to make sure the Doctor's work is not in vain because of a hardware error in your system, you'll also want to call in Diagnostics II.

Disk Doctor and Diagnostics II (from Supersoft) are software utility packages that run under the CP/M environment. The Doctor recovers data from problem disks, including accidental erasures and even files from disks with damaged direc-

✓See List of Advertisers on page 146

tories; Diagnostics II applies stringent tests to all hardware to determine if it is functioning properly.

Disk Doctor

The programs do not require any special knowledge of the CP/M file structure. If you are running programs under CP/M, then you can run Disk Doctor, following the menu-driven, self-prompting format which displays key information.

The five "wards" of Disk Doctor—five separate routines on the disk which can be called up, depending on the problem—provide a variety of different remedies to deal with differing disk ailments.

Starting with the simplest functions, ward E simply displays the directory, including entries for recoverable erased files. When CP/M erases a file, it does little more than change one byte that effectively "blinds" the system to the existence of the file. It does not go out to the disk and erase the actual file. Ward E puts parentheses around those file directory listings which have been erased, but for which data probably remains on the disk and which are recoverable.

The main reason for using ward E of Disk Doctor is probably in preparing to use ward D, whose primary function is to recover those erased files. In fact, if you know the exact name of the erased file, you can go directly to ward D for the recovery function.

Ward D reads the directory of a disk and then rewrites it, with minor changes, back to the disk. Thus it operates as an erased file recovery routine and as a fast directory repair routine.

The user is asked by ward D to place the disk with erased file in the "patient" drive, and the file name is typed in. Ward D then automatically restores the file and the directory listing to active use, and the name pops back into the directory where the system can again access the data, if the information has not been written over.

In the first three wards, A, B and C, Disk Doctor gets down to some heavy work. Ward A examines a diskette and locks out the bad sectors without touching the good sectors. Ward B copies selectively, under manual user control, whatever can be read from a crashed diskette and places it in a new file. Ward C automatically copies the entire diskette, replacing bad sectors with an equivalent number of empty spaces.

Summing up the function of these three wards, Herb Schildt, president of Supersoft, said, "To put it most simply, wards A, B and C avoid the error traps that CP/M has built in. Under normal circumstances, when you get a bad sector on a disk, the whole disk bombs. You can't use it, or anything on it, at all. By circumventing the error traps that cause that situation, the good sectors on the disk are again available to the user."

There are two caveats about the entire Disk Doctor program. First, the utility is not, according to Supersoft, useful with binary files—except for "un-erasing" them. Binary files are virtually impossible to read and reconstruct once a sector is missing.

Second, Supersoft notes that proper installation of the program to fit the user's hardware configuration is vital. While the installation procedure is self-prompting, it does need information on such items as low and high sector numbers, sectors per track, number of tracks per disk, and a couple of other hardware parameters. Once properly installed, the program needs no further system information.

The 26-page manual is direct and clear, with much hardware information in an appended table to help with the installation of the program.

Disk Doctor requires a 48K CP/M system, with two drives for complete operation. The cost is $100 (manual alone, $10).

The 26-page manual is direct and clear, with much hardware information in an appended table to help with the installation of the program.

Diagnostics II

Diagnostics II tests all aspects of all hardware—CPU, memory, drives, terminal and printer—of a microprocessor system. The point of regular testing with the package is spotting developing problems, or problems that are not yet harmful or permanent, rather than experiencing a failure during a critical operation.

All the routines examine and stringently test the major areas of computers using 8080, Z-80 and 8085 central processing units. The tests are self-explanatory and self-prompting and require no special knowledge of the hardware beyond the ability to run normal programs. The sequence of test execution suggested by Supersoft is memory, CPU, drives, terminal and printer.

The first three tests—memory, CPU and drives—run on automatic pilot, keeping track of the accumulated errors. The last two—printer and terminal—obviously require some operator interaction and observation. Finally, there is a "quick test," which tests memory, drives and CPU, one after the other, in two to four minutes and which will disclose any major failings in the system. This is particularly useful to run at the start of each session with the computer.

Finally, if you find that all this testing is boring stuff, the whole package can be submitted under a "TESTALL.SUB" file, which is supplied with the disk and lets you go to the seashore or up in the space shuttle while all the tests are merrily cooking away in proper order and depth.

Diagnostics II requires a 32K CP/M system and sells for $100 (manual alone, $15).

(Supersoft, Inc., PO Box 1628, Champaign, IL 61820.)

Ed Coudal
Park Ridge, IL

Biofeedback Package

Micros can be beneficial to your health

Although Biofeedback has captured the public's imagination (see, for example, Barbara Brown's book, "New Mind, New Body," Bantam Books), it has, for the most part, been the province of professionals. Until recently, the biofeedback instruments that were available to the general public were, with only a few notable exceptions, expensive, unreliable, awkward to use, and/or sometimes potentially dangerous.

The Biocom has changed this. It is a sophisticated software/hardware package which, when connected to a microcomputer (most popular models) via an RS-232C or a parallel interface, will allow you to record, measure, display, print out, and do biofeedback training for galvanic skin response (GSR). It is safe and really works! I have been using it quite successfully for the past six months—both on myself and several of my patients.

Biofeedback can be defined as follows: "allowing someone to hear and/or see the functioning of a bodily process in real time so that he can, with practice, increase his voluntary control over this bodily process."

When the bodily process under consideration is the GSR (the amount of electrical resistivity of the skin), a process that is closely related to the level of arousal/relaxation, you can begin to appreciate that learning to control this bodily process is no trivial matter. Most people with this kind of biofeedback training can quickly learn to relax more effectively. Hence GSR Biofeedback is often a most potent weapon in our attempt to prevent and ameliorate the ravages of stress.

The Biocom lets you do GSR Biofeedback at home, without expensive professional supervision. The Biocom, as anything else, can be misused; it can, for example, be used as an alternative to psychotherapy by someone who needs professional help. Nevertheless, its potential for keeping individuals healthy should not be overlooked or compro-

mised. Moreover, the Biocom and devices like it open up a whole new dimension of personal computing.

The documentation for the Biocom is adequate, but less than you might expect given its price and the sophistication of the hardware and the software. The software is written primarily in Basic with some machine-language subroutines to help it along; hence the programs are easily modified.

For example, I have found it more convenient to start the Relaxation Trainer program, when using the GSR by myself, with a software "Voice Activated Key" (simply saying "start" loudly), rather than the more usual "HIT <ENTER> WHEN READY". I don't have to disturb the relaxation process by getting out of my recliner, pressing the enter key, and then sitting down again. Rather, when I am comfortable and ready to relax, I just tell the computer to start.

You can also modify the Relaxation Trainer program to provide audio as well as visual feedback.

The Biocom package includes two other programs—a lie-detector program and an electronic version of the Ouija Board. In addition to their fun value as games, these programs, particularly the lie-detector, may have considerable usefulness.

I have on several occasions used the lie-detector program to help patients identify emotionally charged areas of their lives which they were apparently completely unaware of (e.g., whenever the word "father" was presented on the screen there was a large GSR emotional response). Similarly, the Ouija Board program with appropriate modification might be quite useful in training a handicapped individual to communicate by learning to control his GSR.

(Total Digital Engineering, 210 Daniel Webster Highway, South Nashua, NH 03060. $125.)

Maurice Small, Ph.D.
Nashua NH

Zardax

How much word processing power can you and your Apple II handle?

I've been using (and touting) Super-Text II for over a year. It's a terrific program, especially with its Form Letter Module and Address Book packages, and I'll continue to use it—until I can scrape up the $295 for Zardax. The reason is simple: except for math functions, Zardax on one disk does what Super-Text II does on three, and more. Further, it's easier to use, which makes it faster—and in my business, speed of operation is expressed in dollars.

Zardax does a fine job with 40-column format, but really shines when used with an 80-column board. It supports four—DoubleVision, SmartTerm, Videx and Vision-80.

The program requires a 48K or more Apple II or Apple II Plus, with at least one disk drive (DOS 3.3). It comes with two program disks (to compensate for their being copy protected). Once Zardax is in memory, you can put the program disk away and use other disks for file storage. Files are stored as standard text files, so may be accessed by other software.

The package is a bit overwhelming at first glance, because it requires a hardware modification to operate. The modification sets up the Apple for upper/lowercase operation (without need for an adapter) and must be made before Zardax will run. When you first boot the disk, Zardax checks to see if the modification has been made; if not, the program tells you to make it and exits to Applesoft—you don't even get to see the menu.

However, the modification requires no soldering on the newer Apples, as the retrofit kit supplied with Zardax consists of two wires terminated at one end with a plug that replaces one of the chips, and at the other end with clips for attaching elsewhere. Older Apples require a little more finesse than I have, so I had it done at the local computer emporium.

The modification gives you true shift key capitalization, with the CRTL key acting as shift lock. Since these keys are located the same as on a typewriter, you don't have to waste time searching for the right key.

Once the modification is done and the computer lets you in, you'll find Zardax to be a pretty friendly program. After booting the disk, you have the choice of "Setup" (changing the configuration) or going right into the program. The first time on, you'll be forced into "Setup," where Zardax will ask you a number of questions regarding your system. If you're using an 80-column board, it will want to know what kind it is and what slot it's in. It will ask a number of equally nosy questions about your printer and its interface. When it's through grilling you, Zardax will know more about your system than you thought you knew—and will be able to use it all.

New users of word processing systems should find Zardax easy to learn, for the keyboard acts like a typewriter.

Two menus are available to you—the main menu and the inner menu. The main menu comes up when you first enter the program, and whenever you ask for it from the inner menu. From the main menu, you can perform 17 word processing functions, such as create a new document, print a document from disk, multiprint a set of linked documents, retrieve a document from disk, transfer a document to another disk, delete a document from a disk, lock a document on a disk, unlock a document on a disk.

Most of the inner menu commands as-

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sume a document is already in memory, such as: change the document (edit mode), print a draft of the document, print the document in memory, rename a document, save the document to the disk.

Thirty menu functions are available, but Zardax also has 23 editing functions and 49 print formatting commands, the last seven of which are user programmable. Eleven of the editing functions pertain to cursor movement within text; the remainder allow you to delete characters or blocks of text, move blocks, find-and-replace, underline and so forth.

The print formatting commands allow you to exercise all the capabilities of the most expensive daisywheel printers (pitch change, boldface printing, print in red, print in black, space-and-a-half, superscript, subscript, etc.) as well as those of dot matrix printers (enhanced characters, doublewidth printing, etc.). They also include such commands as "stop printing" (allowing you to change to another type face in printers that allow this), justify text, ragged right, ragged left, page break (if you want to force one), conditional page break (so a single line is not left an orphan at the top of a page), and so on. These commands are all embedded in text, while you're in the edit (change) mode.

One of the most valuable functions for manuscript writing is the use of automatic headers and/or footers. With Zardax, it's easy. The program can support both headers and footers in the same document.

One of the most rewarding capabilities of a good word processing system is the ability to print dozens (or hundreds) of letters automatically, with each one having the appearance of a personal letter. Few Apple word processing programs can do this. Of the few that I've seen, Zardax does it most easily—not necessarily the best, but certainly most easily.

You set up a name and address file by first defining the elements of that file. Simply type in the name of each element, each one on its own line with a curly bracket on each end. This is called the label set, and is immediately followed by a series of info sets.

Info sets contain the actual name and address data, and are typed in the same format as the label set—without the curly brackets.

```
{Name}
{Address}
{City}                    Label Set
{State-Zip}
{Greeting}
{Prize}
```

———————(Underline mine)

```
Mrs. Gordon Smithers
4242 16th S.W.
Seattle                   Info Set
WA 98199
Mrs. Smithers
a free microwave oven
```

In preparing the address file you may follow the label set with as many info sets as you wish, skipping no lines and formatting each info set exactly like the label set. In fact, you don't even need Zardax to prepare the addresses—any program giving you text files will do, provided you can somehow get the curly brackets needed for the label sets.

The letter itself is just as easy. Use the curly brackets to tell Zardax to merge information from the address file, and the labels used in the label set to tell it which variables to use.

A really useful tool in the Zardax bag is its glossary function. With this, you can store often-used statements in memory and call them as needed when composing a document.

First load the applicable glossary with "G" (for glossary) from the main menu, and identify the glossary you want. Then, when you reach a point in text where you wish to insert one of the glossary items, type CTRL-G and the letter designation of the item you want. Since the item may be several lines of text, this can save a lot of time in document preparation.

The glossary may also hold print formatting commands, relieving you of the need to put them in individually when changing formats within text.

The serious user will be hard put to find a better word processor for the price.

Most word processors underline, if the printer supports it. But Zardax is one of the few which allow underlining the space between words—or any other space, for that matter.

To many users, this would be a mere detail. But I write technical manuals for a living, and use the Apple/Diablo combination to produce camera-ready copy. Paragraph headings look better when the whole heading is underlined instead of only the words. Also, sometimes I need a horizontal line all by itself on the page. This feature means that I don't have to work on a page with pen and straight edge.

Some of my printwheels have a degree sign where the apostrophe normally is. Without programmable functions, I would lose the apostrophe when using these printwheels. The seven user-programmable functions allow me to recover this (and other "lost" characters) as well as let me pick up special Diablo functions such as shadow print.

Tests showed that my 48K Apple with Videx 80-column board will hold about nine pages of closely packed text (one inch margin all around on 8½ × 11 inch paper) as one file. One side of a disk will hold 6 such files, for a little over 52 pages.

In actual practice, it would be better to limit a file to about five pages, to allow easy revision. A system without an 80-column board has about 8K less usable memory, so it will hold less pages in memory. The amount of disk space would be the same, however, so such a system would allow more capacity-sized files on a disk.

I've used 40-column video for a long time, and have become so used to it that I can visualize the page by seeing only the left side of it. I thought I'd never need an 80-column board. But now I've worked with 80-column video, and I probably won't be happy until I have it in my system. Zardax is an impressive word processor with 40 columns, but a superb one with 80.

Wraparound on text input is pretty much the same as with 40 columns, except that the line is longer. But Videoprint lets you see the whole line at once, at about a half-page at a time. The improvement is as great as that from black and white to color television.

The manual gives a thorough treatment of the program. It makes no assumptions about the user's computer expertise, and so begins with a discussion of the Apple II and its disk drives. It continues with discussions of basic and advanced Zardax use, and an overview of the system which defines every command available to the user. Finally, it talks to the expert, giving him a great deal of useful information in writing programs which can interface with Zardax, or printer driver routines for unusual printers. A reference card is included which gives a short definition of each command.

Organization could be better; you'll find yourself doing a lot of page flipping as you learn the system. I would like to see some of the single use chapters moved to appendices where they would be out of the way, or index tabs separating major sections. The need for these devices is an indication of the wealth of information included in the manual.

Casual users of word processing can probably get along with half the system Zardax is, using one of the many lesser-priced systems on the market. But the serious user, to whom the $295 price tag is a reasonable expense, will be hard put to find a better word processor for the price. The only improvement I would like to see is adding the capability to print with proportional spacing. My Diablo is capable of doing this, but the program does not support the capability.

(Action-Research Northwest, 11442 Marine View Drive SW, Seattle, WA 98146).

David Goodfellow
Seattle, WA

TRS-80 DOS
Apple Word Processors
Rx for Crashed CP/M Disks
Biofeedback with Micros

Ultrados

Well-documented, easy to use DOS for TRS-80 Model I

There are several different disk operating systems for the TRS-80 Model I. Some are better than others, but most lack an important feature that is often overlooked by software producers—good documentation.

It is most irritating trying to use software that is poorly documented. The software itself may be excellent, but the documentation does not give enough details or examples for the user to easily use the features. But this is not the case with Ultrados.

Ultrados and Superbasic (supplied on disk) is well documented, and, in most cases, the manual gives examples on how to use the commands and utilities. It is in an 8 ½ × 11 inch format, 112 pages in length, in a soft-cover binder. The only criticism of the documentation is that it is not typeset, but printed in all capitals with a dot matrix printer. This format makes it slightly more difficult to read than standard upper- and lowercase text.

The manual is organized in five sections:

1. Introductory Information—gives an overview of Ultrados with its functions and purpose; describes its syntax and semantics, which is similar to TRSDOS; gives the loading procedure; and finally, provides a very useful procedure for making a backup of Ultrados.
2. Ultrados Operating—gives detailed descriptions of the operating commands, with examples of their use.
3. Superbasic—gives detailed descriptions of Superbasic commands, with examples.
4. Ultrados Utilities—describes the function of the utilities with examples of their use.
5. General Information—describes some of the technical information about the system including the number of tracks used, and the drive stepping speed (which is easily changed for faster drives); file information for a minimum system; and an error message for differences between TRSDOS and Ultrados.

Ultrados is an excellent DOS, with many of the features a programmer requires for efficient programming. It is compatible with Level II and TRS Disk Basic, and they highly recommend that the user purchase a TRSDOS and Disk Basic Reference Manual.

Ultrados is easy to use. For example, if you want to renumber a Basic program that you are working on, simply enter a colon (:) followed by the new line number and the increment, or

:100,5

to renumber a Basic program with a beginning line 100, by increments of 5.

Ultrados is an excellent DOS, with many of the features a programmer requires for efficient programming.

Another useful feature is the variable reference function, accessed by entering a semicolon (;). So if you want to find every line that used the variable Z in your Basic program, enter ;Z.

A third useful feature is operated by depressing the JKL keys, all at once, allowing the contents of your video display to be sent to your printer for printing. This feature is available in other Disk Operating Systems, but Ultrados will not print blank lines after all the text (or graphics) has been printed. Also, if you forgot to turn your printer on when depressing JKL, the computer won't "hang up" and look for the printer.

The global editing feature is also quite useful. This will allow you to operate on your Basic programs. You can do many time-saving functions with this feature.

For example, you may decide to change a certain variable name to another variable, possibly to be more suitable to the function it is used in. Global editing makes this change possible. It searches for the desired variable and changes it to the new variable name. You can also change items in the data list, integers and strings. You can create compressed strings, merge lines, split lines and change reserved words.

As you can see, Ultrados is quite complete and well documented.

(Level IV Products, Inc., 32461 Schoolcraft, Livonia, MI 48150. $94.95.)

Howard Berenbon
Southfield, MI

Word Handler

Apple II word processor that requires no extensive hardware add-ons

The Word Handler is one of the new generation of word processing programs that attempt to make the most efficient use of the capabilities built into the Apple II. The program requires a 48K Apple II or II Plus with at least one disk and, of course, some sort of printer. That's about as minimum a configuration as one can hope to use for word processing.

The most noticeable feature of the Word Handler is the 66-column compact video display. It displays upper- and lowercase lines up to 66 high-resolution characters long on the Apple screen. You can also select the non-compact format in which the lines are split into two or three parts, depending on paper width and margins selected.

In either case, text is maintained as the pages and lines will appear when printed.

(continued on page 172)

Reader Service for facing page ↙65→

Thinking Multiprocessing?

Think Teletek's SBC-1

Teletek's SBC-1 provides each user in a multi-processing system with his own CPU, serial ports, parallel ports, CTC, 128k of segmented memory with (optional) "RAM drive." The **SBC-1** is the most powerful S-100 slave processor available today.

- System may run at 4MHz with **SBC-1** running at 6MHz
- Z80A or Z80B processor
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- CTC provides counter/timer outputs available to the user
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- optional "RAM drive" capability allows extremely fast operation
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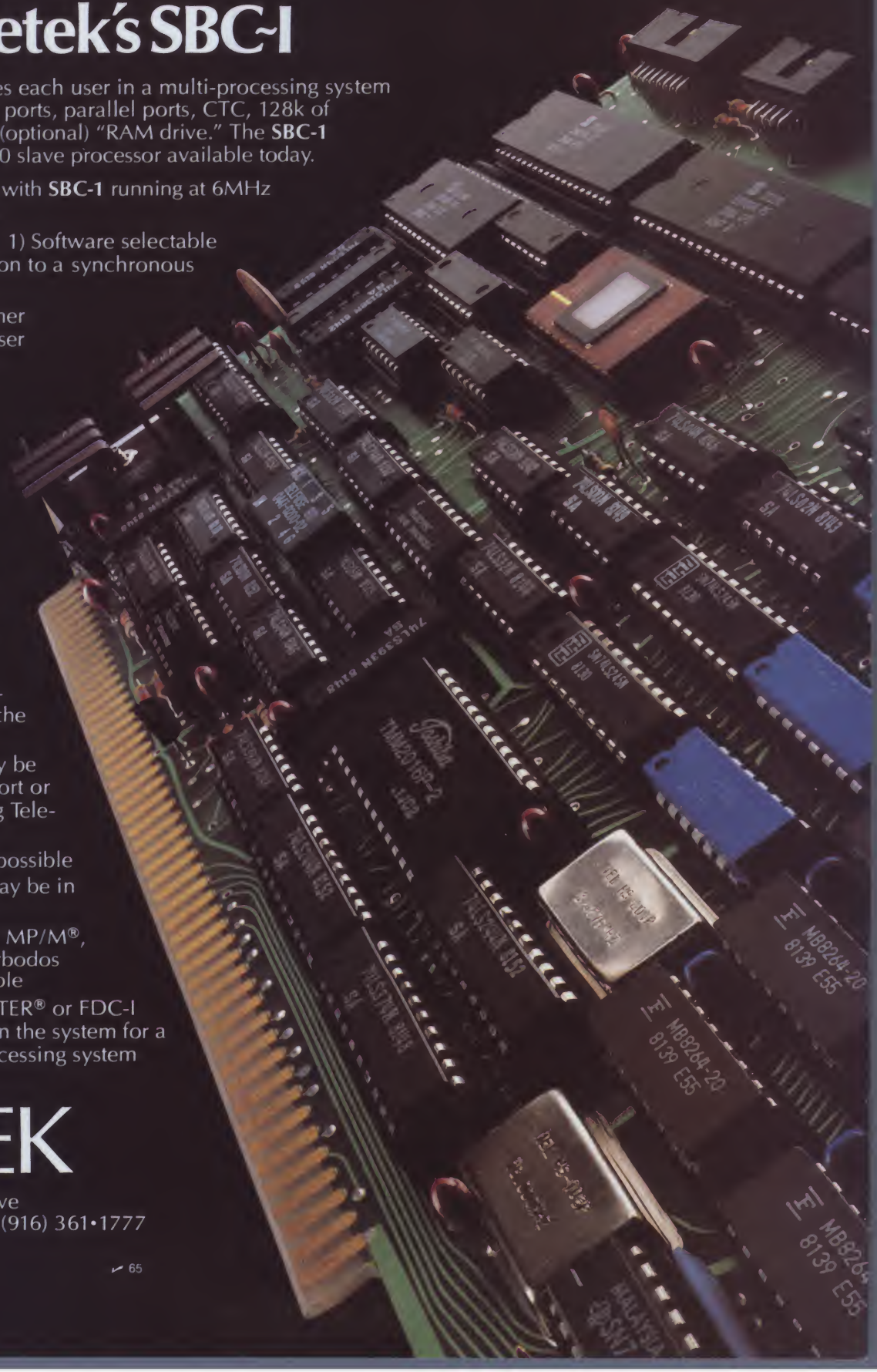
- As many as 16 **SBC-1s** may be in use simultaneously
- Digital Research (CP/M®, MP/M®, CP/NET®), Infosoft or Turbodos operating systems available

Use Teletek's SYSTEMASTER® or FDC-I as the master processor in the system for a state-of-the-art multi-processing system that begs comparison!



TELETEK

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✓ 65

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On the new, slicked-up, trimmed-down Starwriter F-10.

It's C. Itoh's latest generation of letter-quality printers.

It cranks out flawless copy at 40 cps; and its full 15" carriage lets it double in brass for both letter processing and business applications. You can plug it into almost any micro on the market (serial or parallel) simply by plugging it in. And then make it keep on trucking with inexpensive, easily available Diablo compatible daisy wheels and ribbons.

In its serial mode, it can print just about anything (including boldface, underlines, subscripts and superscripts), and snap the carriage back to start the next line in less than a second. In its line mode, it prints in both directions, for even faster throughput.

(While making about as much noise as a cat walking on Kleenex.)

It's a nice, portable 30 pounds—about 10 pounds lighter than the Starwriters before it. And it stands exactly as tall (or precisely as small) as a dollar bill.

Speaking of which:

Incredibly, the Starwriter F-10 sells for about the same preposterously low price as its predecessors. Which is to say, about $800 less than a lot of other printers that don't even come close to measuring up. Or even better...

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